UNIVERSITÉ DE SHERBROOKE

Faculté d'éducation

# L'effet de l'utilisation d'études de cas en ligne sur le rendement des élèves dans un cours d'infirmière en médicine et chirurgie

The Effect of Using Online Case Studies on Student Achievement
In a Medical Surgical Nursing Course

Par

Michelle Bayard

Essai présenté à la Faculté d'éducation
en vue de l'obtention du grade de
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**The Effect of Using Online Case Studies on Student Achievement In a Medical Surgical Nursing Course**

Michelle Bayard

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## ACKNOWLEDGEMENTS

I would like to acknowledge the support and patience of my supervisor, Priscila Castillo-Ruiz. Her comments and feedback made this project a success.

I appreciate the support that I received from Vanier College throughout my Master's education in the form of release time and professional development funds. To my colleagues at Vanier and second year Medical Surgical team who made my data collection run smoothly, I thank you for your support. To Karen White for helping me with the final touches of this report, I thank you.

I thank Elsevier publishers for allowing me and the participants in this study the complimentary use of their HESI online case studies. The HESI case studies are part of an e-learning module that compliments the nursing textbook. This project would not have occurred without their support.

I would like to thank my MTP professors and classmates for shaping my mindset, sharing your experiences and supporting me through this lengthy process. I am forever grateful for this learning experience and humbled by your generosity.

To the students at Vanier College who shared their time and wisdom with me. You have made me a better teacher and with gratitude, I dedicate this project to you.

Lastly, I thank my spouse for her patience, support and love. You ignited the spark and believed in me.

## ABSTRACT

The challenge for nursing education today is the complexity of our healthcare system influenced by patient acuity and technological advancements. Nursing teachers continue to explore teaching strategies that engage students in active learning (Popil, 2011) while maintaining patient safety and quality of care. The challenges that nursing teachers face at the present moment is the use of appropriate teaching methods or strategies that would enhance critical thinking based on the complexities of care the students will face moving forward in their career. The increasing demands of fulfilling curriculum content, the changing health care system and the overload of information may have a direct impact on the performance of our students (Delpier, 2006). Case studies can help bridge the knowledge gap and enhance understanding by actively engaging nursing students in their learning.

This study will explore the use of the HESI online case studies as an innovative teaching strategy to enhance performance outcomes through higher levels of thinking and the opinions about the use of this pedagogical tool to help improve learning in nursing students. A convergent mixed methods strategy for both quantitative and qualitative data was used in this study. A convenience sample with two repeat measures using a pre-test/post-test design and a questionnaire about student opinions and perceptions was utilized on 43 students in the second-year of a nursing program. Two specific research questions were addressed in this research study. A convenience sample with two repeat measures using a T1 (pre-test), T2 (post-test), T3 (post-test) and a questionnaire was utilized on students in a second-year nursing program.

The conceptual frameworks guiding this study are constructivism and student learning. Teaching strategies such as online case studies not only support active learning but provide opportunities for new knowledge to be constructed during the learning process (Wright, 2011).

# RÉSUMÉ

Le défi actuel de la formation infirmière est la complexité de notre système de santé, influencée par l'acuité du patient et les progrès technologiques. Les enseignantes en sciences infirmières continuent d'explorer des stratégies d'enseignement susceptibles de faire participer les élèves à un apprentissage actif (Popil, 2011) tout en maintenant la sécurité des patients et des soins de qualité. Le défi actuel des enseignantes en sciences infirmières est l'utilisation de méthodes ou de stratégies d'enseignement appropriées qui renforceraient la pensée critique en fonction de la complexité des soins auxquels les étudiants seront confrontés au cours de leur carrière. Les exigences croissantes en matière de contenu pédagogique, l'évolution du système de santé et la surcharge d'informations peuvent avoir un impact direct sur les performances de nos étudiants (Delpier, 2006). Des études de cas peuvent aider à combler le fossé des connaissances et à améliorer la compréhension en impliquant activement les étudiants en sciences infirmières dans leur apprentissage.

Cette étude explorera l'utilisation des études de cas HESI en ligne en tant que stratégie d'enseignement innovante pour améliorer les résultats en termes de performance grâce à une réflexion approfondie et les opinions sur l'utilisation de cet outil pédagogique pour aider à améliorer l'apprentissage des étudiants en sciences infirmières. Une stratégie de méthodes mixtes convergentes pour les données quantitatives et qualitatives a été utilisée dans cette étude. Un échantillon de commodité avec deux mesures répétées utilisant une conception pré-test / posttest et un questionnaire sur les opinions et les perceptions des étudiants a été utilisé (e) sur 43 étudiants de deuxième année d'un programme de sciences infirmières. Deux questions de recherche spécifiques ont été abordées dans cette étude. Un échantillon de commodité avec deux mesures répétées utilisant T1 (prétest), T2 (post-test), T3 (post-test) et un questionnaire seront utilisés sur les étudiants dans un programme de soins infirmiers de deuxième année.

Deux questions de recherche spécifiques ont été abordées dans cette étude. Un échantillon de commodité avec deux mesures répétées utilisant T1 (prétest), T2 (post-test), T3 (post-test) et un

questionnaire seront utilisés sur les étudiants dans un programme de soins infirmiers de deuxième année.

Le cadre conceptuel guidant cette étude est l'approche du constructivisme et de l'apprentissage des étudiants. Les stratégies d'enseignement telles que les études de cas en ligne soutiennent non seulement l'apprentissage actif, mais offrent également la possibilité d'acquérir de nouvelles connaissances au cours du processus d'apprentissage (Wright, 2011).

## SUMMARY

The challenge for nursing education today is the complexity of our healthcare system influenced by patient acuity and technological advancements. Nursing teachers continue to explore teaching strategies that engage students in active learning (Popil, 2011) while maintaining patient safety and quality of care. The challenges that nursing teachers face now is the use of appropriate teaching methods or strategies that would enhance critical thinking based on the complexities of care the students will face moving forward in their career. The increasing demands of fulfilling curriculum content, the fast-changing health care system and the overload of information may have a direct impact on the performance of our students (Delpier, 2006). Case studies can help bridge the knowledge gap and enhance understanding by actively engaging nursing students in their learning.

This study explores the use of the HESI (Health Education System, Inc.) online case studies by Elsevier as an innovative teaching strategy to enhance performance outcomes through higher levels of thinking and the opinions about the use of this pedagogical tool to help improve learning by nursing students. The use of Creswell's (2013) convergent mixed methods strategy merges the qualitative and quantitative assessment data collected. A contiguous approach was used to analyze data separately and compared them in order to better understand the problem, in turn, creating coherence of the data to be expanded upon in the report. A convenience sample with two repeat measures using a pre-test/post-test design and a questionnaire about student opinions and perceptions was utilized on 43 students in the second-year of a nursing program.

Two specific research questions were addressed in this research study. The first research question addressed whether online case studies would have an effect on higher performance outcomes through higher levels of thinking in students. More specifically, we wanted to determine if topics for which students applied case studies showed greater improvement of relevant knowledge than topics learned without the use of case studies or standard presentation thereof. A comparison of unit exams, T1 (pre-test), T2 (post-test 1) and T3 (post-test 2) in both groups determined whether there was an overall improvement in scores.

The second research question explored perceptions and opinions regarding the use of online case studies as a pedagogical tool to improve learning. This part of the study sought to determine the student's opinion as to whether the use of online case studies as a pedagogical tool would result in a positive impact on their learning experience.

For the first research question, a T1 (pre-test), a T2 (post-test after class instruction) and a T3 (post-test after case studies) were used to determine if the topics selected with case studies would score higher on T3 compared to the topics selected with no case studies or by standard presentation. The results showed a significant difference on T3 between the topics selected with case studies compared to the topics selected with no case studies. The unit exams were compared in both groups with a higher overall average on the final unit exams containing the topics selected with case studies.

The second research question explored the perceptions and opinions regarding the use of online case studies as a pedagogical tool to improve learning. Students reported that case studies were relevant to their learning of the subjects and allowed for deeper learning of these subjects. Students gave high scores in areas such as motivation, helping to bridge the gap between what was taught in class and what was experienced in clinical. Additionally, they indicated that the multiple-choice questions attached to the case studies prepared them for their unit exams. Students strongly agreed that online case studies were an enjoyable experience, and were preferable over case studies taught in class and/or clinical.

The results of this study suggest that online case studies significantly improved the post-test scores in both groups. The final exam scores did not, however, demonstrate significance in both groups.

In summary, this study shows that HESI online case studies can be used to enhance student learning in a medical/surgical nursing course. Further research may examine how this platform can be used for remediation and preparatory work in the clinical setting.

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| | |
|---|---|
| HESI | Health Education System, Inc. |
| OIIQ | Ordre des Infirmières et Infirmiers du Québec |
| CEGEP | Collège d'enseignement général et professionnel |
| CBL | Case Based Learning |
| SCL | Student-Centered Learning |
| NCLEX-RN | National Council Licensure Examination for Registered Nurses |
| MELS | Ministère de l'Éducation et de l'Enseignement Supérieur |
| A2017 | Automne 2017, Fall semester |
| H2018 | Hiver 2018, Winter semester |
| T1 | Pre-test (pre-test prior to instruction) |
| T2 | Post-test 1 (post-test 1 post class instruction) |
| T3 | Post-test 2 (post-test 2 post case study exercise) |

# INTRODUCTION

The nursing program at Vanier College is a three-year professional program with a focus on the nursing care of the adult, psychiatric, geriatric, obstetric and pediatric populations in various clinical settings. The goals of the program include: consistency, integration and the transfer of learning from the classroom and laboratory to the bedside. At the end of their studies, graduating nursing are expected to meet requirements needed to develop the professional skills and achieve the standards outlined by the *Ordre des Infirmières et Infirmiers du Québec* (OIIQ). Graduates are required to successfully manage the care of patients in a hospital setting in a manner that is aligned with the specific patient populations introduced in each course.

In 2014, Vanier College reviewed the program to ensure that its nursing students would be well prepared to deal with current issues, patient complexity and the care of patients in rehabilitation centers and/or hospital settings. The revision incorporated the program evaluation vocabulary used by MELS to integrate a set of learning activities leading to the achievement of educational objectives. These objectives were based on a set of standards nursing students require for their successful entry into the profession. Because of the program revision in 2014, Vanier College was able to integrate the competencies that were relevant to the nursing students and remove those that were no longer relevant.

As previously mentioned, the nursing program must ensure that nursing students follow the standards imposed by the OIIQ. These standards are very specific and have, as a main objective, the protection of the public. The OIIQ developed the 'Mosaic framework' that embodies holistic patient care and should be part of the clinical competencies in the nursing program. This framework guides nursing practice based on three major components: functional, professional and contextual. All three components attempt to comprise the many different clinical situations faced by health care professionals.

The Vanier College Nursing Department has successfully incorporated these elements from the OIIQ nurses' clinical competencies of the Mosaic into the new curriculum. In this way, the

nursing department at Vanier College has respected the ministerial competencies established by MELS while bridging the gap between the learning expectations of the nursing student and these competencies outlined by the OIIQ. In doing so, the nursing department has effectively changed the curriculum in order to promote a deeper understanding of the dimensions of providing holistic care to patients.

Our health care system is complex and this is influenced, in part, by patient acuity and technological advancements. In response to such intricacies, nursing teachers must explore teaching strategies that engage students in active learning (Popil, 2011). A contemporary challenge that nursing teachers face is the selection of appropriate teaching methods or strategies that can enhance critical thinking in a way that is linked to the kinds of care the students will face in their career. The increasing demands of fulfilling curriculum content, the changing health care system and information overload may have an impact on the performance of our students (Delpier, 2006).

One way to encourage active learning and critical thinking in our student population is through the use of case studies as a teaching strategy (Day, 2011). Case studies can be used as a means of reinforcing new content with previously learned information. Also, content in case studies can be tailored to the learning objectives of the course and situations experienced in the clinical setting. Students can use case studies to actively engage in a scenario that they may encounter in the hospital and provide a deeper understanding of the complexities of the patient population. It has been stated that case-based learning is an educational paradigm closely related to problem-based learning, where a case, or problem, is used to trigger the acquisition of knowledge, skills and attitudes desired in students (Williams, 2005). According to the author, cases are written as problems that provide the background of a patient or of a specific clinical situation. Such cases allow students to develop intrinsic and extrinsic motivation, and increase self-evaluation and critical reflection. These effects then lead to scientific inquiry and the integration of knowledge and learning skills.

HESI (Health Education System, Inc.) is a standardized online case study platform developed by the HESI Company that may be used for remediation or intervention in the nursing program. The case studies are designed so that each scenario follows a client presentation through to the

resolution of a plan of care. Students test their knowledge based on a series of content-oriented multiple choice-type questions that provide feedback and rationales to the answer. The content of the case studies is cross-referenced with the assigned medical-surgical nursing textbook.

# CHAPTER 1: STATEMENT OF THE PROBLEM

First year nursing program courses are designed to take into consideration the understanding of the complexity of human anatomy and physiology and the acuity of various pathologies encountered in the clinical setting. First-year students learn basic nursing terminology and assessment skills as a foundation for more advanced second- and third-year courses. As nursing students advance to the second year, they develop a deeper understanding of the nursing process. The transfer of basic knowledge to application of that knowledge into more complex situations operationalizes the development of critical thinking. Bloom's taxonomy of the cognitive domain (Bloom, 1956) emphasizes factual and conceptual knowledge as it is encountered by students in the first year; analysis and application is explored in the second and third year. Laboratory sessions in all three years of the nursing program allow the nursing students to practice their skills in a safe environment before entering the hospital and to provide care to patients.

Clinical experience in the first year often takes place in rehabilitation centers. The first-year students practice basic nursing assessments as well as nursing tasks such as medication preparation, wound assessment and injections. When referring to Bloom's categories of cognitive complexity such as recollection and understanding, first year students function at the lower levels of Bloom's taxonomy (Bloom, 1956). In the second year of nursing, students' general clinical performance usually progresses exponentially faced with increased complexity of care required of patients in the acute care settings.

The primary challenge for second year students is the mastery of the relevant declarative knowledge, concepts and procedures in nursing that would reinforce critical thinking in relation to complexities of patient care (Smith & Ragan, 1999). Students often have difficulty bridging the gap between theory and practice. Concepts taught in class and practiced in the laboratory do not always fully prepare students for situations they will encounter in the clinical setting. This fact impedes academic performance and may lower a student's sense of self-efficacy. Success in navigating adversities provides the foundation for being confident when confronted with future obstacles (Bandura, 1977).

Nursing programs in the CEGEP system continue to follow a teacher-directed approach. Typically, traditional lectures are content laden and consist of lists of objectives, learning outcomes determined by measurable behaviors and unidirectional teacher-to-student transmission of information. According to Ramsden (2003), this type of teaching situates students as passive recipients of the wisdom from a single speaker. As a result of this process, it is assumed that learning will occur as long as the information is conveyed upon the students. An example of this unidirectional teaching method is best demonstrated by a teacher who lectures (perhaps with the aid of a PowerPoint presentation) to otherwise passive audience, in this case, nursing students.

A didactic approach such as this serves to perpetuate a subject-centered classroom where teaching is the transmission of authoritative content or the demonstration of procedures. Additionally, the content-heavy teaching that is common to many schools of nursing promotes a teacher-centered approach where covering all the content or the greatest number of topics is the main objective. Of course, class time should permit the presentation of learning however, students in a teacher-directed classroom become easily overwhelmed by the course content and often struggle to keep up with the heavy flow of information. Very little learning takes place in a classroom where students are focused on note-taking. As a result, students approach a subject by memorizing lecture content with little understanding of how to apply the knowledge in a real-world situation.

Ramsden (2003) refers to this type of teaching as the Theory of Telling and Transmission that focuses on what the teacher does to the student and where the teacher is an expert in the subject matter. The issue with the teacher-directed type of instructional method is that it lacks the ability for the students to connect theory with practice and to develop the critical thinking skills needed to interpret real world events, such as the transfer of knowledge and retention of information to higher order thinking skills. It is also important for students to develop problem solving skills and to help them to become lifelong learners in their field of study (Baxter Magolda,1992).

While this traditional method of teaching remains the primary mode of instruction, another important element in a nursing class is the recognition of the diversity of learners and their needs. Given the complexity of the medical environment, all nursing students should be encouraged to

become actively involved in their own learning. Presently, the nursing department uses active learning strategies such as: simulations, seminars, laboratory practice, and post-clinical discussions of cases to encourage active learning in our diverse learners.

Bridging the knowledge gap between the first and last years in the development of nurses at the CEGEP level requires that solid knowledge of the basic concepts acquired in the first year be applied to more complex situations as those encountered in the subsequent years of the program. If students understand rationales associated in the care of complex patient situations, then further transitions in the program will occur with students experiencing deep and meaningful learning. Nursing students often feel pressured to incorporate the taught concepts into a holistic picture for safe practice. If learning outcomes are unsuccessful, then students are confronted with the obstacle of poor achievement and low self-efficacy (Glanz, Burke, & Rimer, 2011).

Although there is a good amount of case-study research in nursing, there is almost no literature about the use of online case studies as an innovative teaching strategy. At the same time that case studies provide a context within which students can integrate unfolding information about a concept or topic, they also serve as an effective teaching strategy to enhance deep learning and improve perceived self-efficacy in academic performance. The latter is achieved by actively engaging nursing students in the learning process.

Case-based learning (CBL), a closely related learning and teaching strategy, is well known to be effective in enhancing learning (Onyura et al, 2016). It requires students to use prior knowledge to solve cases that are relatable to practice (Garvey et al, 2000). Case studies are therefore an important instructional approach involving students' analytic review and discussion of real-life scenarios and therefore are a good link between academic content and real-life practice.

# CHAPTER 2: CONCEPTUAL FRAMEWORK

Case based learning (CBL) is an instructional design approach where learners prepare in advance and problem-solve in small groups while a facilitator engages them by guided inquiry (Onyura et al, 2016). CBL activities support the constructivist approach for meaningful learning and active student engagement. These activities encourage the transfer of prior knowledge to new situations, student engagement and autonomous learning (Tanner, 2009). And while CBL stimulates the acquisition of knowledge, it encourages critical reflection and integration of learning and self-reflection (Williams, 2005).

In constructivism, learning follows a student-centered approach by which students initiate, modify and expand their own knowledge (Tanner, 2009). Richardson (2003) proposes that constructivism is a theory of learning where individuals create their own understandings on the basis of an interaction between what they already know and the knowledge they come into contact with. Within this approach, the building of new knowledge helps the student to develop insight and problem solving based on available knowledge and real-life situations. More explicitly, learners retrieve prior knowledge and focus their attention on meaningful situations. Piaget proposes that learners construct knowledge by initiating actions and reflecting on the results of those actions (Larson, Young, & Leibham, 2011). The constructivist approach claims that students who are active participants in their learning are actively constructing their knowledge and understanding of complex issues in nursing (Brandon & All, 2010). Although a constructivist approach offers many advantages to develop critical thinking and deeper understanding of the concepts in the nursing program, many nursing teachers still prefer to teach according to a traditional approach. This approach is based on the premise that learning comes from reading the text and listening to the lecture.

According to self-determination theory, the motivation to learn is based on three needs: the need for relatedness, competence and autonomy (Ryan & Deci, 2000). Completing exercises such as case studies has the potential for students to feel competent when they understand the course material and feel that they may be successful in the course. By completing online case studies on their own promotes autonomy and a sense of satisfaction in their success. In a study conducted by

Williams (2005), it was found that students' confidence and motivation increased when they became accustomed to cases that challenged their learning and motivated them to advance to more challenging case studies.

According to Loyens et al. (2007), student learning has shifted in the last decades from being a simple acquisition process based on teacher transmission, to a process by which students actively construct their own knowledge and skills. Students internalize meaning and make connections with what they already know. Students are proactive and take control of their own learning, that is, they become self-regulated. The premise of the self-regulation theory is that students regulate their behavior by assessing their learning needs, removing the unwanted stimulus and evaluating the outcomes of the change. Pintrich (2004), postulates that learning is an active, cognitive process enhanced by a sense of control, is goal oriented, and involves self-regulatory activities that serve as mediators between personal performance and characteristics.

Self-regulation incorporates psychological functions that are an integral part of motivational beliefs such as the benefit of an action, the motivational process and outcome as well as metacognition or self-monitoring of the effectiveness of a task (Hmelo-Silver, Duncan & Chin, 2007). Case studies follow the principles of self-regulation in such a way that exercises provide value to the learning process, they motivate students by increasing their effort and encouraging them to complete the task. Case studies also allow students to self-monitor their understanding of the topics covered and improve the learning outcomes. Self-regulation will occur when students reflect on what needs to be learned and create a state of dissonance in relation to their learning (Hmelo-Silver, Duncan, & Chinn, 2007).

Attribution relates to how a learner interprets events and it explains how a person's perception of past success or failure contributes to their future motivation and learning (Demetriou, 2011). In the CBL paradigm, attribution theory stresses that case studies must be designed to consider the ability of the learners, and it should not be too complex in that it discourages the learner and leads to frustration. The case studies should match the expected learning outcomes and complexities taught in the course for the students to create meaning with new information. The student may perceive the case study as a challenge but the effort is worth it if it has a positive

outcome to the student's learning (Demetriou, 2011). A desired state of understanding will occur when the student is capable of making a meaningful connection between theory and the real world. The self-efficacy theory also highlights self-perception as being an important motivator on how a student views his/her own success and failure, which will then influence the level of his/her own academic achievement (Bates, & Khasawneh, 2007).

The student-centered learning (SCL) theory aims at methods of teaching that shift the focus of instruction from the teacher to the student. It incorporates the principles of the development of learner autonomy and independence by moving the responsibility for learning to the students and focusing on skills and practices that enable learning and independent problem solving (Hannafin, & Hannafin, 2010). The SCL approach has shown to be effective in higher education and is in tune with the constructivist theories of learning. It is characterised by the use of innovative teaching methods to promote student learning and active participation, thus fostering problem-solving and critical thinking attributes in the learner (Wright, 2011).

By completing online case studies, the student will develop active and cognitive learning processes. The activity will give the student a sense of achievement and willingness to persevere with the task.

Inquiry-based learning such as case studies encourages analysis and evaluation of scenarios by identifying key points and interpreting information using decision making and critical thinking. Case studies activate the cognitive level of learning and the student learns to analyze a scenario by critiquing and making connections based on different experiences to help improve higher-order thinking skills (Graves, 2009; Overbaugh et al., 2012). A study by the National Center for Case Study Teaching in Science demonstrates that instructors using case studies as a pedagogical tool in their classrooms reported that students showed better learning and higher understanding of the topic. (Herreid, 2005).

Case studies offer students the opportunity to make sense of information by showing real life situations and a way for students to reflect and challenge new knowledge by connecting it to previously learned information (Huitt, 2006; Warin et al., 2011). Case studies certainly comply

with the characteristics of constructivist pedagogy proposed by Richardson (2003) as they provide opportunities to add, challenge and change understandings through tasks. Case studies also allow the development of students' awareness of their own understandings and learning process (metacognition).

One specific benefit of case studies in nursing education involves the transfer of knowledge from a theoretical perspective to an applied environment. As a consequence, the student experiences deeper learning of the topics. Case studies put students into a context reflective of a hospital setting to allow them to manage patient care in the closest way possible to real life. This gives the student a sense of self-efficacy and motivation to continue working on case studies to enhance their understanding of patient complexities.

In the last decade, online learning activities have become an innovative teaching strategy used to help students achieve curricular success using self-paced learning opportunities (Glenn, 2008). Case studies provide a flexible delivery system that encourages engagement and motivation beyond using a traditional lecture approach (Williams, 2005). According to Drexler (2010), our students are networked, meaning they connect to peers, teachers and information for ideas using different online sources. Online collaboration tools such as this one, support individually paced learning with a dynamic delivery of content which enhances the positive experience for the student. The benefit of technology is the expanded access to references and educational resources online. Online case-based learning provides a way for students to pursue self-directed learning, use web resources and actively develop problem-solving skills that would enhance their critical thinking. It can motivate students to become more engaged in their learning and shift from a passive to an active learning approach. Interactive online case studies encourage the learner's interest and allows for reinforcement of information (Entwistle, 2000; Sitzman, Ely, Brown, & Bauer, 2010).

According to Glenn, (2008) online activities, collaboration tools and software that supports individually paced learning is expected to improve academics in the coming years. The use of online learning activities will transform the student experience by providing the opportunity to focus on the application of knowledge to particular problems using case studies versus the memorization of content presented in a didactic classroom. Students who participated in online

learning activities as a collaborative tool for active learning performed better not only in exams but encouraging understanding and retention of new concepts. (Joziak, 2015).

# CHAPTER 3: LITERATURE REVIEW

## 3.1 LITERATURE

Having examined the theories associated with online case studies, we will now look at the empirical research associated with this topic. Some of the research articles found are comparable to this research proposal as they work with healthcare students in a nursing environment similar to the one offered at the CEGEP level. Other studies discuss the use of online activities as a companion activity to classroom instruction, highlight the effectiveness of student learning, and transfer of knowledge. Case study research is plentiful but more specifically, case studies in the context of scenarios.

### 3.1.1 Online case-based learning activities and academic performance

The emerging theme of online Case-Based Learning (CBL) highlights the impact of online activities on academic performance, in particular with case studies. In general, studies have shown that online case studies improve student understanding, critical thinking and learning in relation to outcomes; more specifically, they improve knowledge and test scores. The literature review also shows studies that compare lecture-based learning and e-learning while observing their effect on academic performance. These studies do not show a significant difference in enhancing student knowledge. These findings have, as a consequence, prompted this research to see the effect of online learning in nursing education.

One study discussed the use of online case studies and the National Council Licensure Examination for Registered Nurses (NCLEX-RN) outcomes in nursing schools in the United States. Mihal (2006) investigated the effectiveness of Elsevier's online case studies and licencing exam scores in American nursing schools. This was an ex-post facto research design using a convenience non-probability sample on 22,785 students. The study involved dividing schools into two groups: The testing group used the HESI online case studies and the control group did not. The mean score of the licencing exam for those two groups were compared. The schools using online case studies had an overall higher score in the licencing exam compared to the schools not using the online case studies. A *t*-test for two independent samples was used to compare the mean

licencing exam scores of both groups. The findings indicated that the licencing exam score for the schools who used the HESI online case studies had a higher mean ($t$=9.979) compared to the group that did not use the case studies. The $t$-test results of .0527 suggested that there is a 'medium effect' of using the HESI case studies on the nursing licensing exam indicating the $t$-value had some importance. Therefore, Elsevier's HESI online case studies had a positive effect on students' licencing exam scores.

A second study by Young, Rose & Willson (2013), used a nonexperimental descriptive design to compare the licencing scores of students n=1437 who used the HESI online case studies to those students n=2484 who did not use the HESI online case studies. A $t$ test analysis showed that the students who used the HESI online case studies had a higher score in their licencing exam compared to those who did not use the HESI online case studies. It was concluded in this study that the students who used the HESI online case studies outperformed in the licencing exam at first attempt with a 92.69% pass rate compared to the group who did not use the HESI online case studies, 89.49%. Students developed critical thinking skills when answering the questions in the case study presented. This appeared to be a key component of success for those students who used the online case studies.

A third study by Cherkis & Rosciano (2015) examined the use of a structured remediation program to help nursing students pass their licencing exam. The remediation program involved a variety of active learning strategies such as the use of case studies, critical thinking exercises and practice exams to improve student achievement in the nursing licencing exam. The study was a non-experimental cross-sectional one-group post-test research design used to determine if the remediation program using case studies and other learning activities would help improve the student outcomes on the licensing exams. The findings indicated the overall pass rate for the licencing exam post remediation using case studies and other learning activities increased to 90.76% compared to the previous year of 72.2% pass rate. According to the authors, the active learning remediation program that included the case studies encouraged students to examine, understand, and apply complex nursing concepts.

Kaddoura (2011) used case-based learning (CBL) as an active learning strategy to examine critical thinking of nursing students from two curricular approaches: case-based learning and didactic instruction. A convenient sample of 103 nursing students from third year enrolled in either the lecture-based program or the case-based learning program. The results of this quantitative comparative descriptive study demonstrated that the students mean score in The California Critical Thinking Skills Test (CCTST) in the CBL program was 14.45 with a standard deviation of 2.80. The mean score for the CCTST in the lecture-based program was 10.11 with a standard deviation of 3.15. The independent sample *t* test demonstrated that there was a significant difference between the CBL group and the lecture-based group, and that the overall scores showed better performance in the CBL group. The study also suggested that the students in the CBL program were more likely to learn to think critically. Students who use CBL are challenged to look at problems in a different perspective, make conclusions based on limited information and conflicting issues seen in real world contexts.

A study by Hugenholtz et al. (2008), used a randomized controlled trial to examine the effectiveness of e-learning amongst 74 occupational physicians (OP). The trial involved four groups (i.e. two in a lectured-based classroom and two in an e-learning classroom. The e-learning module was designed as a self-directed teaching tool for health care professionals. The information on the e-learning platform included case studies with multiple-choice questions. Test assessments of knowledge were made before and immediately after an educational session with either e-learning or lecture-based learning. It was concluded by this study that e-learning enhanced the OP's knowledge. Both groups showed a significant gain in knowledge on mental health care was found ($P<0.05$). However, there was no significant difference between the two educational approaches. Williams (2005) looked at case-based learning as an effective adjunct to the lecture format. It was concluded that it encouraged more discussions in class and a more enjoyable learning environment. Questionnaires in his study demonstrated that not only did the students enjoyed CBL, but demonstrated a marked improvement in clinical reasoning, diagnostic interpretations and critical thinking.

### 3.1.2 Motivation and E-learning case study activities

Motivation is essential to the learning process and the need to achieve or accomplish something encourages intrinsic motivators to self-regulate in their learning. Tasks that are enjoyable and useful encourages motivation only if there is a perceived value in the task. Goal-directed behaviors that are influenced by internal value (an activity that is enjoyable and pertinent to learning) and tasks (i.e. online case studies) show a positive relationship between motivation and persistent behaviors (Afzal, Ali, Khan, & Hamid, 2010).

One study by Yoo & Park (2015) looked at the effects of case-based learning on communication, problem-solving and learning motivation in nursing students. This was a prospective, quasi-experimental study that compared the pre-test and post-test scores of an experimental group and a non-equivalent, non-synchronized control group of nursing students in South Korea. The results of their findings suggested that the group exposed to case-based learning showed a significant increase for learning motivation, development of communication and problem-solving ability compared to the control group. The scores for learning motivation showed a positive increase for the test group compared to the control group. The authors identified that case studies had a positive effect on motivation and encouraged self-directed learning, stimulated curiosity and intrinsic attention. This in turn improved active participation and self-efficacy in the tasks.

A second study that emphasizes motivation and achievement by e-learning was conducted by Lin, et al. (2014) who investigated the application of the e-learning methods by using a personal digital learning tool on a sample of thirty-one students in a private school. The study was a quasi-experimental design with an experimental and control group and used a pre-test/post-test to test for learning effect. A learning motivation scale (LMS) form by Keller (1987) was revised by the researcher and a pre-test sample questionnaire was built for validity. The LMS was applied and was consistent with a Cronbach alpha coefficient with a total of 0.932. The post-test results revealed that the learning motivation for the experimental group was better than the control group. It was concluded that motivation through the use of learning with e-learning activities had a higher score compared to the control group who had classroom instruction only. The authors concluded

that e-learning activities involved interaction with multi factorial stimuli from the environment and the senses.

Since e-learning activities involve multiple sensory instruction while encouraging self-directed learning, we can assume that e-learning using case studies will promote all the cognitive processes that will enhance the learning experience of the student.

### 3.1.3 Student perceptions and opinions regarding active learning

Mayer (1992) states that when learning is viewed as knowledge construction it implies that learning is active because it involves reaching out of one's mind. The learner is no longer the recipient of knowledge but a constructor of knowledge. Active learning is associated with 'learning by doing', which emphasizes the learner's active participation in the 'experience' of learning. Teachers implement active learning strategies to stimulate the student's experience but do not necessarily know if the strategy implemented has in fact resulted in the desired outcomes.

A study by Lam et al. (2011) demonstrated that students' opinions using e-learning strategies and technology enhanced their learning. The use of technology according to this study demonstrated that students appreciated searching simple learning resources if this strategy was part of the e-learning module implemented in class instruction. The study also revealed that technology use has a direct positive effect on students' opinions on usefulness of e-learning strategies and a beneficial effect of e-learning. The frequency of technology use and e-learning strategies in the classroom increased the perceived usefulness of the e-learning strategies as well as the perceived benefits of e-learning. Therefore, students who used more technology or e-learning strategies would find e-learning beneficial and useful.

A study in China investigated the student opinions about the effectiveness of case-based learning in orthodontic education. Yang et al. (2015) used a case-based learning model on 35 dental students at the fourth year of a five-year dental program. A survey conducted at the end of the course revealed that 85% of the students perceived the case study exercises helped them interpret patients' data, allowed them to apply previous knowledge better in the lecture and made them have

a clear understanding of the basic principles of a treatment plan. The students also perceived that case-based learning helped improve their self-efficacy and self-learning.

### 3.1.4 Goal of the present study

The purpose of this study is to examine a specific pedagogical tool (case studies) and an innovative teaching practice (online activities) to find out if they can improve the students' level of learning and understanding of the topics covered in this course. Another goal of this study is to analyze students' opinions about their experience using case studies and how it improved their learning.

## 3.2 RESEARCH QUESTIONS AND HYPOTHESES

This research project measured the use of HESI online case studies and the effect on student achievement in a medical-surgical nursing course. It also explores students' perceptions/opinions of the HESI online case studies. To conduct this analysis, two research questions needed to be answered:

**R.Q.1:** Will online case studies foster higher performance outcomes through higher levels of thinking in students?

**Hypothesis 1:** If case studies are used and students are tested after the intervention, then they will have a higher test performance on topics using case studies compared to topics using no case studies.

**R.Q.2:** Will the student's opinions/perceptions regarding the use of online case studies as a pedagogical tool help to improve their learning?

**Hypothesis 2:** Students will report that online case studies provided greater confidence, motivation and deeper learning in understanding complex topics compared to no case studies.

# CHAPTER 4: METHODOLOGY

## 4.1 RESEARCH DESIGN

A pilot project using HESI online case studies was conducted on March 27, 2017. The participants were nursing students n = 31 in the pediatrics & obstetrics section of the second-year nursing program at Vanier College. A proposal was drafted and sent to the ethics committee for approval. The committee officially approved the pilot project on March 22, 2017.

The purpose of the pilot project was two-fold. The first purpose was to investigate the user ability of the HESI online case study platform. The HESI case studies in question are part of an e-learning module that compliments the nursing textbook. The nursing textbook is a required text in the nursing program. The use of the HESI online case studies is to provide students the opportunity to use an innovative learning tool and use the companion textbook as a reference to reinforce information or concepts that are unclear. The second purpose of the project was to investigate whether the HESI online case studies enhanced their learning, increased learning motivation, and to provide the experience of using online case studies.

The design for this project was a mixed method convergent design of an intact group to measure and analyse the effects of using HESI online case studies on student achievement in a medical-surgical nursing course at Vanier College.

For the quantitative research, a T1-pre-test, T2 post-test 1, T3 post-test 2 was used to measure the differences between topics with case studies and topics with no case studies.

For the qualitative research, a questionnaire was used to evaluate students' opinions and perceptions about using online case studies.

## 4.2 SAMPLE POPULATION AND PARTICIPANT PROFILE

The study population is a convenience sample of second year medical-surgical nursing students in the third and fourth semester of the Fall 2017 and Winter 2018 academic year at Vanier College. Enrollment amounted to 46 students for the third and fourth semester. All of the students in both groups signed consent forms for a final total sample size of 43.

Student demographics not central to the research but important to note include the fact that the majority of the students are female, with 4 males in the sample. Both groups were provided exactly the same exams (i.e. T1, T2, and T3 pre-test/post-test) for the five subjects.

## 4.3 METHOD

A mixed method was used with a pre-test post-test design. The courses chosen for the research were held in November of 2107 and April 2018 of each semester and covered topics students would encounter in the clinical setting; thus, bridging the gap between theory and practice. Table 1 (below) represents the research schedule for groups A and groups B.

Table 1 - Research project methodology chart Fall Group A and Winter Group B

| SUBJECT | TEACHING APPROACH | TESTS |
|---|---|---|
| | Fall Group A 2017 | |
| Class 1-Subject A<br><br>Class 2-Subject B | Method 1:<br>• Lecture<br>• Reading the assigned chapter in the textbook.<br>• No online case studies | T1 (Pre-test): pre-lecture in class.<br>T2 (Post-test 1): post-lecture in class.<br>T3 (Post-test 2): the following day |

| | | |
|---|---|---|
| Class 3-Subject C<br><br>Class 4-Subject D<br><br>Class 5-Subject E | Method 2:<br>• Lecture<br>• Reading the assigned chapter in the textbook.<br>• Online case studies (to be administered after the lecture; to be completed out of class) | T1 (Pre-test): pre-lecture in class.<br>T2 (Post-test 1): post-lecture in class<br>T3 (Post-test 2): administered the following day after case studies<br>Term Test 3<br><br>Note: The frequency of differing scores will be analyzed through the answers the students give in Term test 3 and the pre/post-test given prior to class and after the lecture. |
| | Winter Group B 2018 | |
| Class 1-Subject A<br><br>Class 2-Subject B | Method 1:<br>• Lecture<br>• Reading the assigned chapter in the textbook.<br>• No online case studies | T1 (Pre-test): pre-lecture in class.<br>T2 (Post-test 1): post-lecture in class.<br>T3 (Post-test 2): administered the following day |
| Class 3-Subject C<br><br>Class 4-Subject D<br><br>Class 5-Subject E | Method 2:<br>• Lecture<br>• Reading the assigned chapter in the textbook.<br>• Online case studies (to be administered after the lecture to be completed out of class) | T1 (Pre-test): pre-lecture in class.<br>T2 (Post-test 1): post online case studies in class.<br>T3 (Post-test 2): administered the following day after case studies<br>Term Test 3<br><br>Note:The frequency of differing scores will be analyzed through the answers the students give in Term test 3 and the pre/post-test given prior to class and after the lecture |
| | | Questionnaire on students' opinion using online case studies at the end of the semester for both groups. |

Subject A – Respiratory infections
Subject B – Cholecystitis/Pancreatitis
Subject C – Men's health
Subject D – Cirrhosis
Subject E – Hepatitis

The HESI online case studies were developed by the book publisher Elsevier and used in A2017 and H2018 course. The experiment was repeated twice to evaluate the validity of the pedagogical tool being used in this study. Therefore, all tools, instruments, questionnaires, and exams are identical. The students started the case study experiment in the month of November

(A2107) and a second group (H2018) students repeated the same schedule in the month of April, with a sample of 43 students involved in the study. The reason for the timing is due to the case studies corresponding to the classes being taught specifically in those months. The teaching approach involved two lectures (subjects A, B) and assigned textbook readings with no case studies in Week 1 and 2, and three lectures (subjects C,D,E), assigned textbook readings and online case studies in Week 3, 4, and 5 (please refer to the above table). A T1 (pre-test) was administered using the teacher resource module from the online textbook prior to the lectures and followed the objectives and course content for that particular class. The levels of knowledge adapted from Bloom's Taxonomy by Anderson & Krathwohl (2001) was used as a guide to evaluate the knowledge and cognitive domains of the T1, T2, and T3 questions as well as the unit term test questions. These tests included factual recall, understanding, analysis and application. A sample in Appendix E shows the leveling of the question using Bloom's Taxonomy. The T1 was administered after the lectures targeted for the study. The online case studies were administered after the lectures on Week 3, 4, and 5 were to be completed at home. Once the students completed the case studies, T3 was administered at the start of the next class the following day. T2 and T3 consisted of the same three questions as that of T1. Term Test 3 consisted of pre-determined questions including all five subjects taught in the month of November and April. The questions were developed by five teachers in the medical-surgical course.

The pilot study conducted in March 2017 revealed an estimated time of 35 minutes for completing the online case studies by the students. The variables to the estimated time included pace, student knowledge of the subject and number of attempts to get the right answer before moving on to the next question.

Students in both groups completed a Likert-type questionnaire to report their experiences about the use of online case studies. The questionnaire covered topics such as motivation, deep learning, bridging the knowledge gap, control of one's own learning and relevancy of the case study content.

## 4.4 ETHICAL CONSIDERATIONS

The research project was approved by the Ethics Board at Vanier College in June, 2017 (Appendix A). The consent form (Appendix B) was used to obtain written consent to participate in the study. The students who did not want to participate in the study had full access to the case studies and pre- and post-tests.

There was no risk or harm to the students involved in the study and confidentiality of all test results and responses was safeguarded. A teacher from the teaching team handed out and collected the consent forms and questionnaires. The T1, T2 and T3 were collected and marked by the researcher; there were no students' names on the tests. Term Test 3 was corrected by the second-year team of teachers. The marking grid was available to the researcher at the end of the semester with the students' names and student numbers removed. The term tests were analyzed for frequency of differing scores amongst students in the class to assign rank (not marks) of strong, medium, or weak to the answers obtained.

The consent forms, Term Test 3, and questionnaire were collected by the assigned team teacher until the following semester and after the final grades have been submitted to the Registrar at Vanier College.

## 4.5 INSTRUMENTS

### 4.5.1 Topic quizzes

Instrument: Brief topic quizzes consisted of three multiple choice questions administered by the researcher. The questions were obtained from the teacher resource module in the Elsevier online textbook. The topic quizzes were administered three times; just prior to beginning topic instruction (T1), immediately after topic instruction (T2), and at the beginning of the class following topic instruction (T3). All three quizzes used the same questions, and were corrected by the researcher

### 4.5.2 Unit test

Instrument: Term Test 3 and answer guide were developed by the teaching team based on the specific learning objectives of the course manual. The teaching team did the correcting of the unit tests and submitted marks to a grid.

### 4.5.3 Case studies

Instrument: HESI online case studies. The students had access to the online case study platform acquired through the book publisher (i.e. Elsevier). The students created an account and were given an access code by the company administrator. The researcher had access to the case studies and activated the case studies specific to subjects targeted for a specific topic. The case studies included multiple choice questions that the students must answer to continue to the next level of the case study. The answers, rationale and textbook reference were provided if the student had difficulty answering a question. The case study platform is interactive as the students can follow links, access the online textbook and watch short video clips imbedded in the cases. The students were given a score for each attempt and had unlimited attempts to improve their grades. The grades from the online platform were not used in this study.

### 4.5.4 Questionnaire on students' perception/opinion regarding use of online case studies

Instrument: Student questionnaire (Appendix C) developed by the researcher and tested in a pilot project May 2017. The questionnaire was used to collect data on students' perceptions and opinions about using online case studies. The questionnaire consisted of 17 Likert-scale questions and two short answer questions with a total of 19 questions asking students to rate their experience using online case studies. The Likert-scale questions consisted of a 5-point scale (i.e. ranging from 1 - strongly disagree to 5 - strongly agree). A paper copy of the questionnaire was distributed to both groups by a team teacher on the last day of class.

# CHAPTER 5: PRESENTATION AND ANALYSIS OF THE DATA

This chapter is divided into two sections. The first section presents descriptive statistics on the data and it will address the first specific research question. The first section will examine whether topics where students use case studies showed greater improvement of topic knowledge than topics without case studies or with standard class presentations. The second section addresses the second question based on the data collection through the student questionnaire and highlights students' perceptions and opinions

## 5.1 DESCRIPTIVE STATISTICS

This section presents descriptive statistics about the performance of Groups A and Groups B based on various measures T1 pre-test, T2 post-test 1, T3 post-test 2 and final exams.

### 5.1.1 Topic knowledge T1

During the month of November of 2017, a pre-test was administered to the Fall Group A before each lecture for the five topics, Hepatitis, Cirrhosis, Men's Health, Respiratory Infections, and Pancreatitis. The measure was repeated on the Winter Group B in April 2018. The T1 consisted of three multiple choice questions obtained from Elsevier's teacher resource. The questions were also chosen to match the learning outcomes in the student's course manual, keeping in mind that the questions needed to reflect the important aspects of the topic. The results for each group are presented in Table 2 and Figure 1:

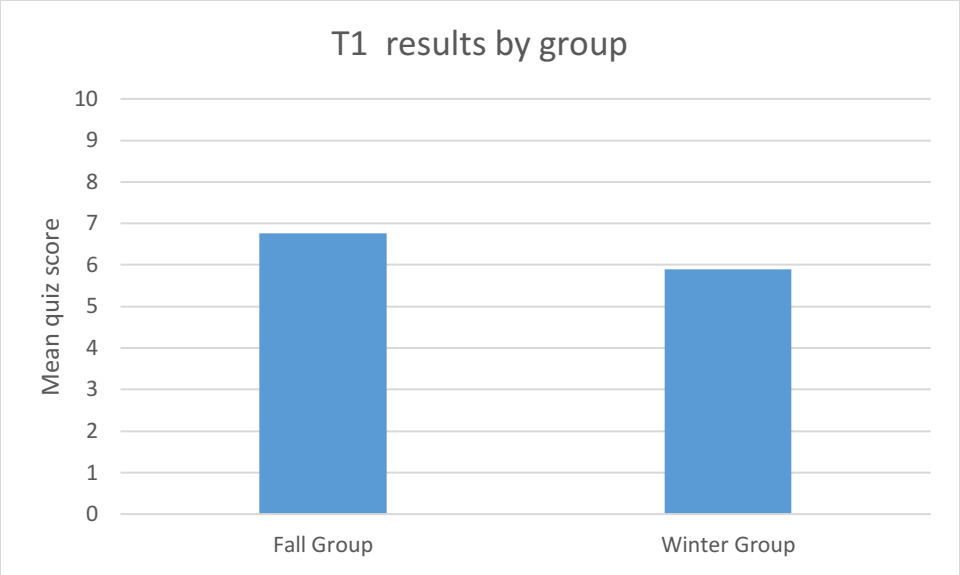


Figure 1 - Bar graph T1 results Fall Group A and Winter Group B

An independent means t-test (2-tailed) showed that there was no significant difference between the groups, where $t = 1.51$, $p = 0.138$. We can assume that both groups were equivalent in terms of topic knowledge prior to the lecture.

Table 2 - Topic knowledge T1 results

| | Fall Group A (n=22) | Winter Group B (n=21) |
|---|---|---|
| Mean | 6.76 | 5.89 |
| Median | 6.0 | 6.0 |
| Standard deviation | 1.76 | 1.85 |

### 5.1.2 Topic knowledge T2

During November of 2017, a post-test 1 was administered to the Fall Group A after each lecture for the five topics, Hepatitis, Cirrhosis, Men's Health, Respiratory infections, and Pancreatitis. The measure was repeated for the Winter Group B in April 2018. The T2 consisted of three multiple choice questions obtained from Elsevier's teacher resource. The questions were

also chosen to match the learning outcomes in the student's course manual, keeping in mind that the questions needed to reflect the important aspects of the topic. T2 was handed out after the presentation of each of the topics. The T2 objective was to determine whether scores changed after the presentation of each of the topics. The results for each group are presented in Table 3 and Figure 2:

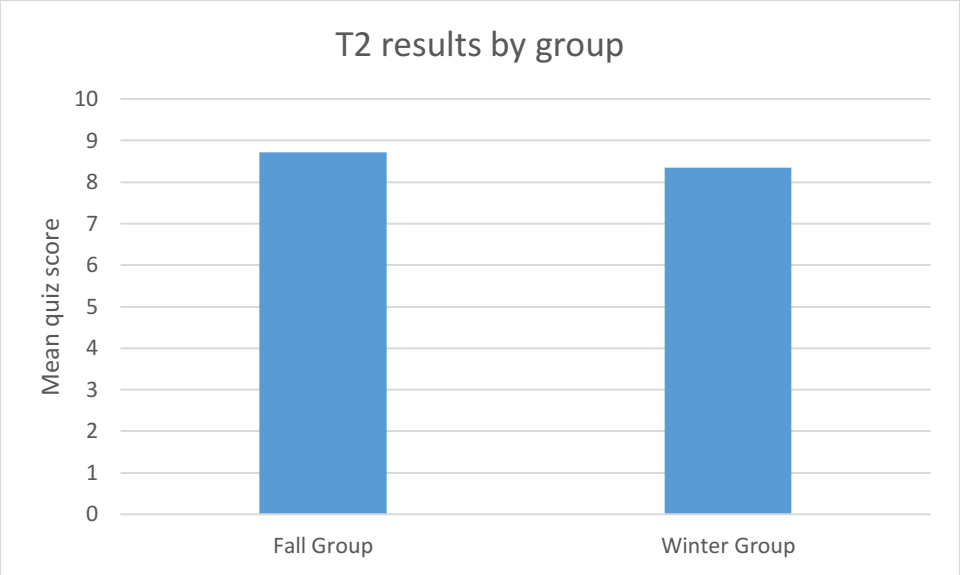


Figure 2 – Bar Graph T2 results Fall Group A and Winter Group B

An independent means t-test (2 tailed) showed that there was no significant difference between the groups, where $t = 0.52$, $p = 0.60$. We can assume that both groups were equivalent in terms of topic knowledge after the topic instruction, and had a slight improvement in topic knowledge after the topic instruction.

Table 3 – Topic knowledge T2 results

| | Fall Group A (n=22) | Winter Group B (n=21) |
|---|---|---|
| Mean | 8.71 | 8.35 |
| Median | 9.0 | 8.0 |
| Standard deviation | 2.39 | 2.06 |

### 5.1.3 Topic knowledge T3

The T3 was administered for the two topics that did not have case studies (Respiratory infections & Cholecystitis/Pancreatitis) and three topics that did have case studies (Men's health, Cirrhosis & Hepatitis) the following day prior to an unrelated lecture. The students in Fall Group A and Winter Group B were instructed to complete the case studies for the targeted topics after the lecture was taught that day. The online case studies for that topic were released by the researcher for the students to start immediately on their devices or at home in the evening. Fall Group A and Winter Group B were given T3 the following day. There were no special instructions given to the two classes that had no case studies. The mean scores for each topic with case studies and topics without case studies were calculated for both Groups A and B. The results of topic knowledge for T3 are presented in Table 4:

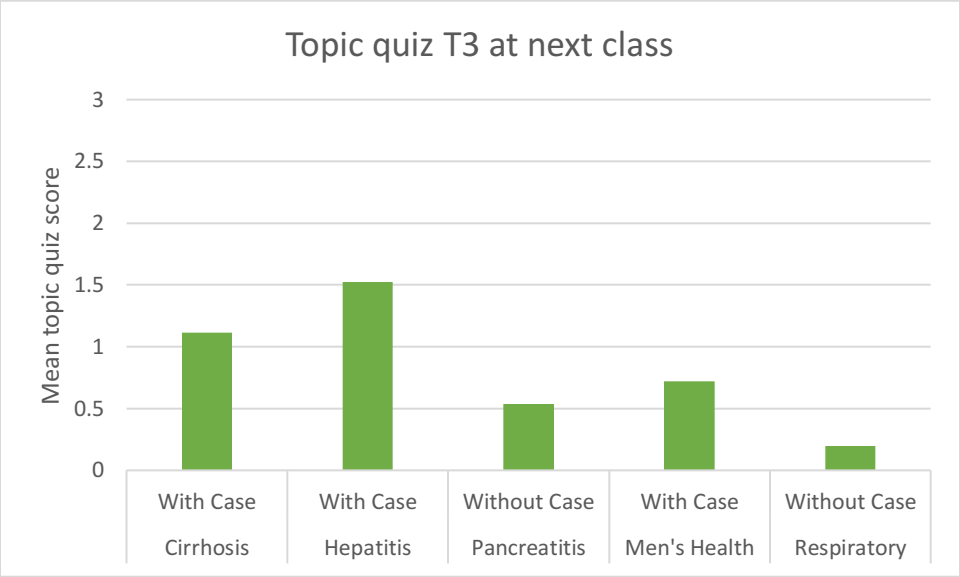


Figure 3 – Bar graph topic quiz T3 at next class

Table 4 – Topic knowledge T3 Fall Group A and Winter Group B

| Case study | Topic | Mean | Standard deviation |
|---|---|---|---|
| Yes | Cirrhosis | 1.116 | 1.117 |
| Yes | Hepatitis | 1.524 | 0.969 |
| No | Pancreatitis | 0.535 | 1.297 |
| Yes | Men's health | 0.721 | 1.098 |
| No | Respiratory | 0.195 | 0.980 |

The distribution of differentials for each of the five topics from the T3 Fall Group A and Winter Group B were higher for the topics with case studies compared to those topics with no case studies. The distribution for each assessment and those topics with case studies differed from those topics with no case studies. The distribution for Cirrhosis, Hepatitis and Men's health is symmetric with a few outliers. It is interesting to note that respiratory infections had the lowest mean and a median of zero with Q3 = 1.0 and Q1= -1.0. It appears from the data that Fall Group A and Winter Group B had difficulty with this topic and that it was not a class that was targeted for the case study research.

An improvement score was calculated from the T3 total score of Fall Group A and Winter Group B minus the total score of the T1 from Fall Group A and Winter Group B. The results of the improvement scores are presented in table 5:

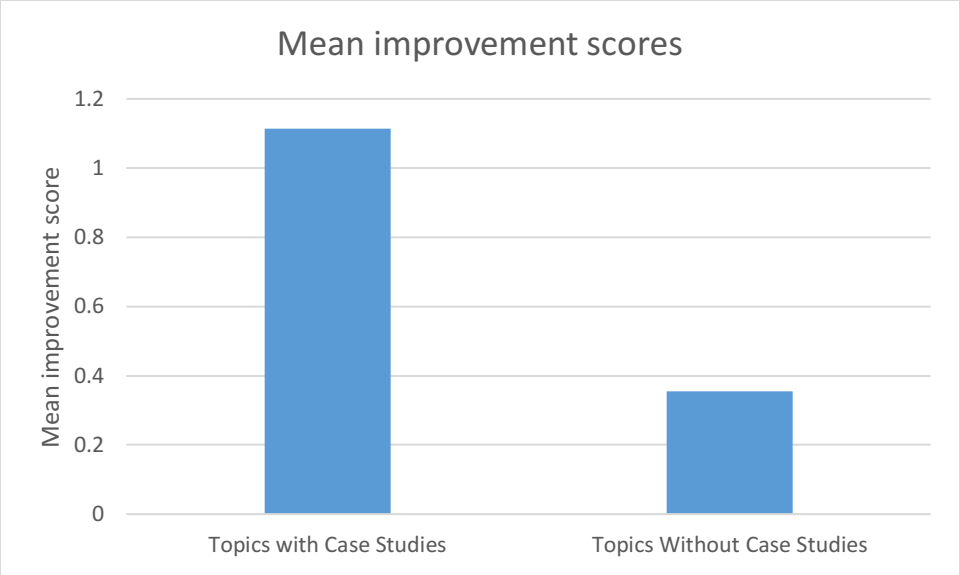


Figure 4 – Bar graph mean improvement scores

The mean improvement difference scores for topics with case studies (m = 1.114) were significantly higher than for topics without case studies (m = 0.354), $t = 5.12$, p = 0.002.

Table 5 - Improvement score T3 quiz – T1 quiz scores

| | Mean | Standard deviation |
|---|---|---|
| Case study diff. score | 1.114 | 0.580* |
| No case study diff. score | 0.354 | 0.752* |

* Significantly different at p = 0.002

When reviewing a number of studies, it is suggested that students scored higher on topics that used case studies compared to those who used standard classroom instruction for learning topics. Online learning also lends to individually paced learning that transforms from memorization of content to application of knowledge by focusing on a particular problem in a case study.

Topic knowledge of T3 in Fall Group A and Winter Group B showed a significant improvement in the topics that had case studies compared to the topics without case studies as indicated by the mean improvement difference scores for topics with case studies (m = 1.114)

versus topics without case studies (m = 0.354), $t = 5.12$, p = 0.002. The difference between the T1 independent means t-test (2 tailed) between the groups, where $t = 1.51$, p = 0.138 and T2 independent means t-test (2 tailed) showed there was no significant difference between the groups, where $t = 0.52$, p = 0.60.

### 5.1.4 Grades

The medical-surgical nursing course has three tests. The third unit test is considered the final exam. The topics covered for this study were included in the third unit test/final exam. The weighting of the final exam/third unit test is 40 percent of the overall grade. All the unit tests were graded by the teachers in this course for Fall Group A and Winter Group B. A comparison of Fall Group A and Winter Group B with respect to Term Test 1 & 2 (no case studies) and Term Test 3 (with case studies) showed no significant difference between the two groups. Winter Group B appeared stronger in relation to overall grades compared to Fall Group A. The results for grade comparison between Fall Group A and Winter Group B are presented in Table 6:

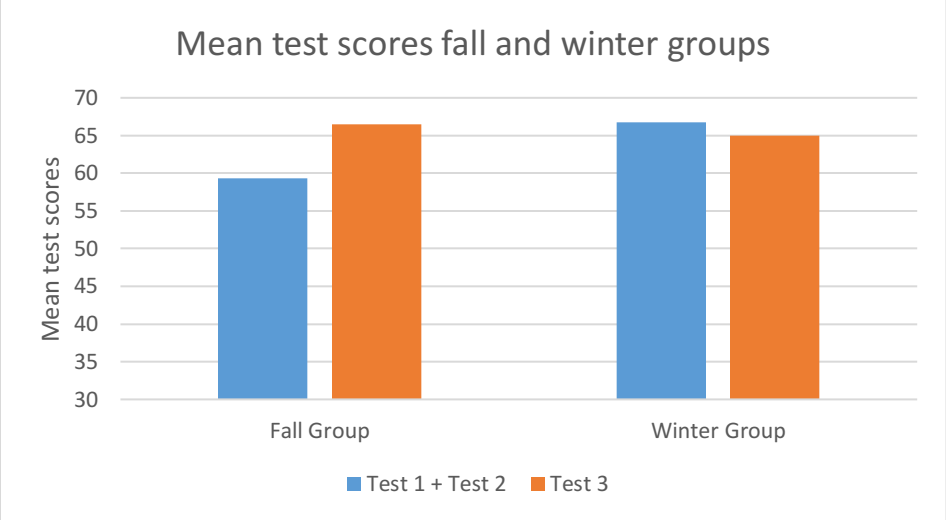


Figure 5 – Bar graph mean scores fall and winter groups

Table 6 – Grade comparison between Fall Group A and Winter Group B

| Group | Mean | Median | Standard deviation |
|---|---|---|---|
| Fall Group A, Test 1 + 2 | 59. 36 | 58.28 | 5.69 |
| Winter Group B, Test 1 + 2 | 66.72 | 67.6 | 8.64 |
| Fall Group A, Test 3 | 66.52 | 66.03 | 7.82 |
| Winter Group B, Test 3 | 65.02 | 66.1 | 10.05 |

A comparison of the average score for topics using case studies and topics with no case studies in Fall Group A and Winter Group B did not show a significant difference. The results for the average scores are presented in Table 7 and Figure 6:

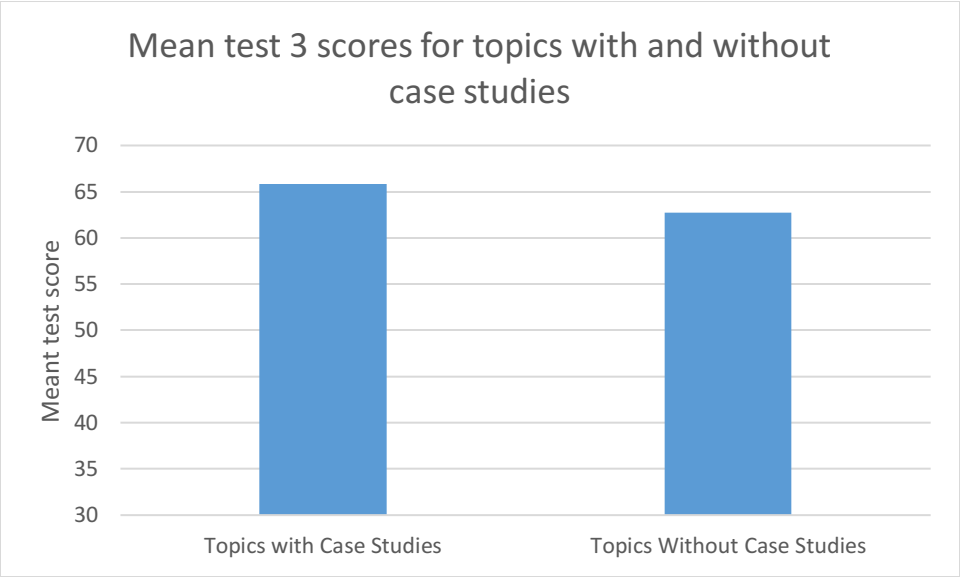


Figure 6 – Bar graph mean test 3 scores for topics with and without case studies

An independent means t-test (2-tailed) showed that there was no significant difference on the average score between the topics with case studies vs the topics with no case studies on term Test 3, where $t = 1.177$, $p = 0.079$.

The observed data indicates that Group A had a lower mean score for Test 1 and 2 compared to Winter Group B, although Fall Group A demonstrated improvement in the final exam. The mean score for Test 3 in Fall Group A and Winter Group B are almost the same. Out of five topics

on Test 3, three topics included the on-line case studies as illustrated in Figure 3. This could indicate that the case studies may have helped the weaker students perform better on the final exam.

Table 7 – Average score on final exam between groups

| | Mean | Standard deviation |
|---|---|---|
| Fall Group A + Winter Group B, Case Study | 65.84 | 8.83 |
| Fall Group A +Winter B, No Cases | 62.72 | 8.01 |

### 5.1.5 Case studies

Both groups were notified one month prior to the start of the research project. Consent forms to participate in the research were signed by students in Fall Group A and Winter Group B at that time. The login instructions and personal codes were provided to the students in Fall Group A and Winter Group B three weeks prior to the start of the study. Both Fall Group A and Winter Group B were given one case study for practice for trouble-shooting purposes and to address any issues related to login and platform navigation. This period was to be used to develop an understanding of how to use the evolving case studies with multiple choice questions. The online case studies are programed to provide immediate feedback for each answer in the evolving case study. With this immediate feedback, students were able to correct the mistake by choosing the right possible answer.

The case studies were released by the researcher once the targeted topics were taught. The students did not have access to the case studies all at once. The researcher set dates corresponding to the target class and the students had access to the case studies immediately after the class. This allowed both groups to use the case studies at their leisure. The case studies would need to be completed before the following day.

A login report and time spent on the online case studies revealed that Fall Group A spent less time on the case studies and logged in fewer times compared to Winter Group B. The results for the login report and time spent on case studies is presented in Table 8 and Figure 7:

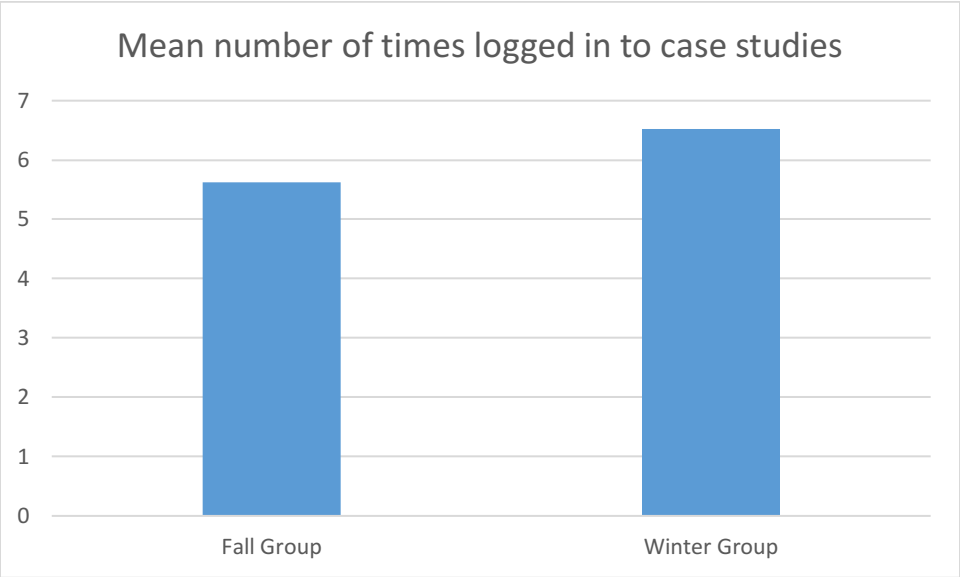


Figure 7 – Bar graph mean number of times logged in to the case studies

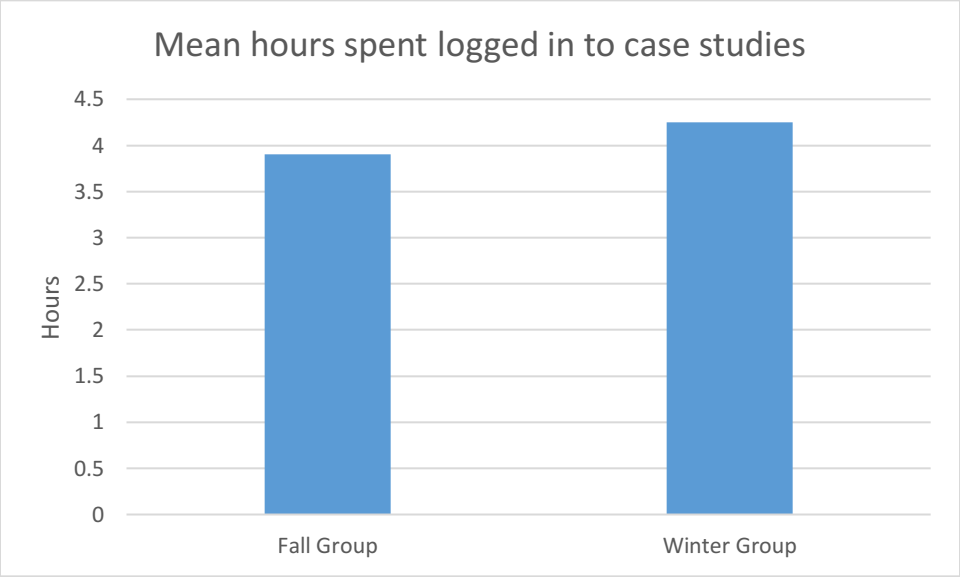


Figure 8 – Bar graph mean hours spent logged in to case studies

Table 8 – Times students login and time spent on case studies

| | Times students login | Time spent on case studies |
|---|---|---|
| | Mean | Mean |
| Fall Group A | 5.62 | 3.90 hours |
| Winter Group B | 6.52 | 4.25 hours |

The significance of the login report and time spent on case studies indicated that Fall Group A logged in 5.62 times and spent 3.90 hours on case studies. Each case study would take roughly 20-30 minutes to complete. Winter Group B logged in 6.52 times and spent 4.25 hours on case studies. We could assume that the more time spent on case studies would lead to better overall scores in T3 and the final exam. Fall Group A showed an improvement of scores on term test 1, 2, and the final exam with improvement on the T3 scores but spent less time on case studies compared to Winter Group B (Table 6 & 8). Winter Group B's scores between term test 1, 2, and the final did not change significantly. The T3 scores for Winter Group B also improved (Table 6 & 8).

### 5.1.6 Questionnaire

This section will describe and analyze the students' responses to the questionnaire, which will address the second research question:

*What are the students' perceptions/opinions regarding the use of HESI online case studies as a pedagogical tool to improve learning?*

The student questionnaire (see Appendix C) included 17 Likert-scale questions that looked at various aspects of students' perceptions and opinions of using online case studies, deep learning, motivation and the use of the online platform. The students were able to write additional comments

not covered in the questionnaire. The number of students who responded to the questionnaire was n = 39.

Students were asked if the case studies allowed for deeper learning of the subjects taught in class. The response on the questionnaire from Fall Group A and Winter Group B was 'strongly agree' (mean = 0.56) to 'agree' (mean = 0.41) with a mean total of 0.97 in agreement.

When asked if the case studies were relevant in their learning about the topics taught in class, the response on the questionnaire from Fall Group A and Winter Group B was 'strongly agree' (mean = 0.51) to 'agree' (mean = 0.38) with a mean total of 0.89 in agreement.

Students were also asked if the case studies motivated them to continue learning about the subject. The response on the questionnaire from Fall Group A and Winter Group B was 'strongly agree' (mean = 0.61) to 'agree' (mean = 0.28) with a mean total of 0.89 in agreement. An example of two students' responses from Group A and B:

Table 9 – Example of student response on the questionnaire

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| Student 1 Fall Group A | 0 | 0 | 0 | 1 | 0 |
| Student 1 Winter Group B | 0 | 0 | 0 | 0 | 1 |

Students were asked if the case studies helped them understand the topic taught in class. The response on the questionnaire from Fall Group A and Winter Group B was 'strongly agree' (mean = 0.51) and 'agree' (mean = 0.43) with a mean total of 0.94 in agreement. Table 10 summarizes the student scores for understanding the topic.

Table 10 – Case studies and understanding of class topic

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| Mean | 0 | 0 | .051 | 0.43 | 0.51 |

The students in Fall Group A and Winter Group B expressed that case studies were relevant to their learning of subjects taught in class, that they allowed for deeper learning of the subjects, and also helped them understand the topics in class. It was also noted in the questionnaire that students in Fall Group A and Winter Group B agreed that case studies helped them take control of their own learning (mean = 0.92) and agreed (mean = 0.88) that case studies helped boost confidence by successful understanding of subjects.

Theory suggests that how students learn and the use of active learning methods can foster deep learning and understanding of information. Online case studies are an example of an active learning strategy which allows the development and understanding of the student's learning process. Students work through evolving case studies at their own pace and receive immediate feedback on a completed question. The students in Fall Group A and Winter Group B 'strongly agreed' (mean = 0.46) and 'agreed' (mean = 0.46) with a total mean of 0.92 that they enjoyed working on a case study online and 'agreed' (mean = 0.87) to a positive experience working online. Figures 9 to 25 show each question and response by Fall Group A and Winter Group B in a bar graph presentation. The findings below are the questionnaire answers presented in a bar graph format in the order of the original questionnaire provided to the students.

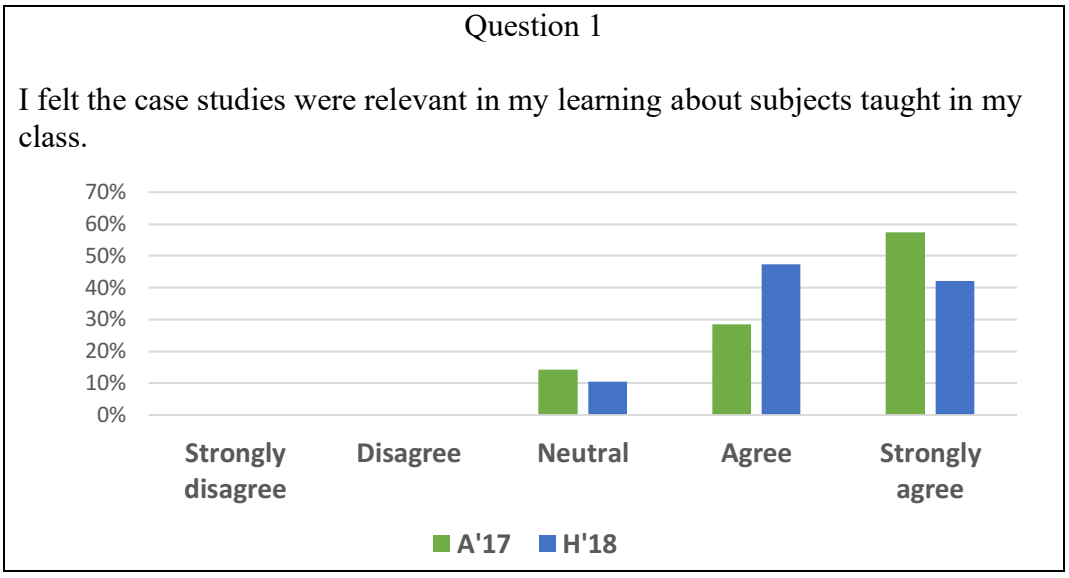


Figure 9 - Bar graph Question 1

In figure 9, both Fall Group A and Winter Group B 'agreed' and 'strongly agreed' that case studies were relevant to their learning about the subject taught in class. A small percentage of students were 'neutral' about this question. Figure 10, Fall Group A and Winter Group B 'agreed' and 'strongly agreed' that case studies allowed for deeper learning of the subjects taught in class with a small percentage of students stating they were 'neutral' about the question.

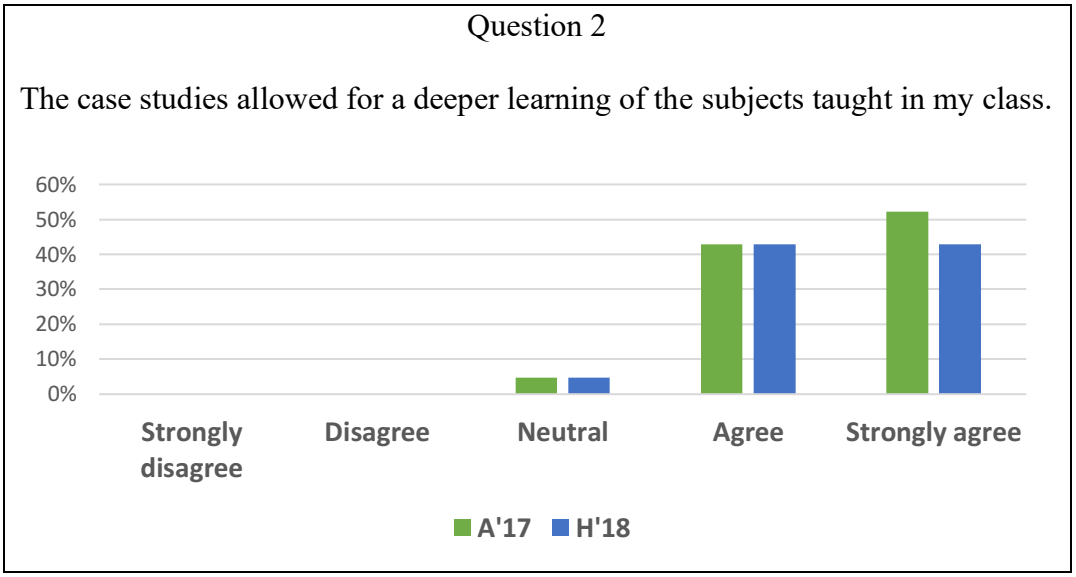


Figure 10 – Bar graph Question 2

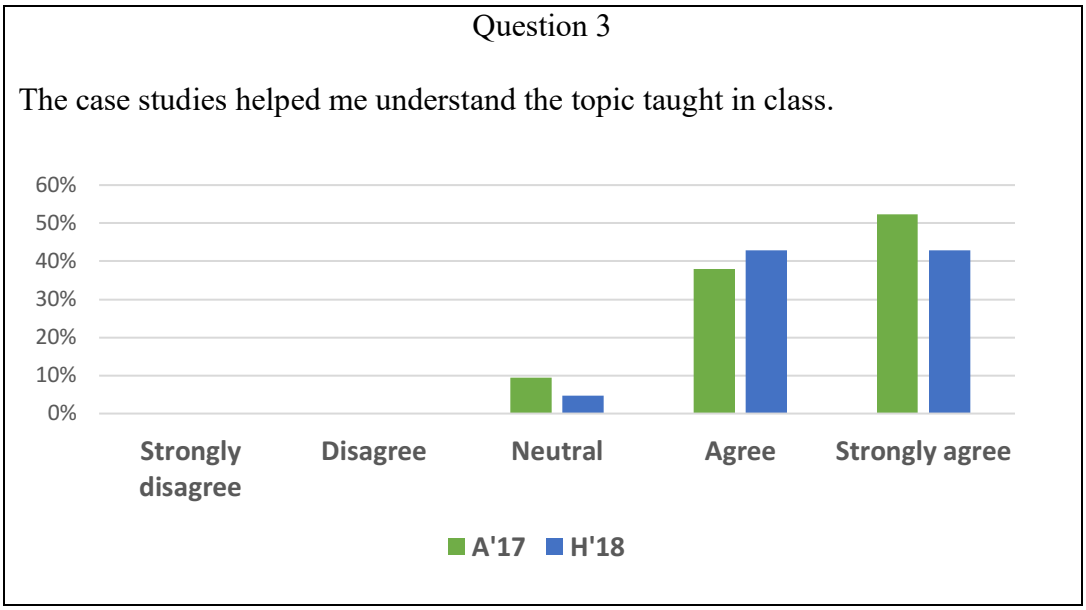


Figure 11 – Bar graph Question 3

In figure 11, Fall Group A and Winter Group B 'agreed' and 'strongly agreed' that case studies helped with their understanding of the topic taught in class. A small percentage were neutral about the question. In figure 12, Fall Group A and Winter Group B 'agreed' and 'strongly agreed' that case studies motivated them to continue learning about the subject. Whereas, a small percentage of students 'disagree' and were 'neutral' about the question.

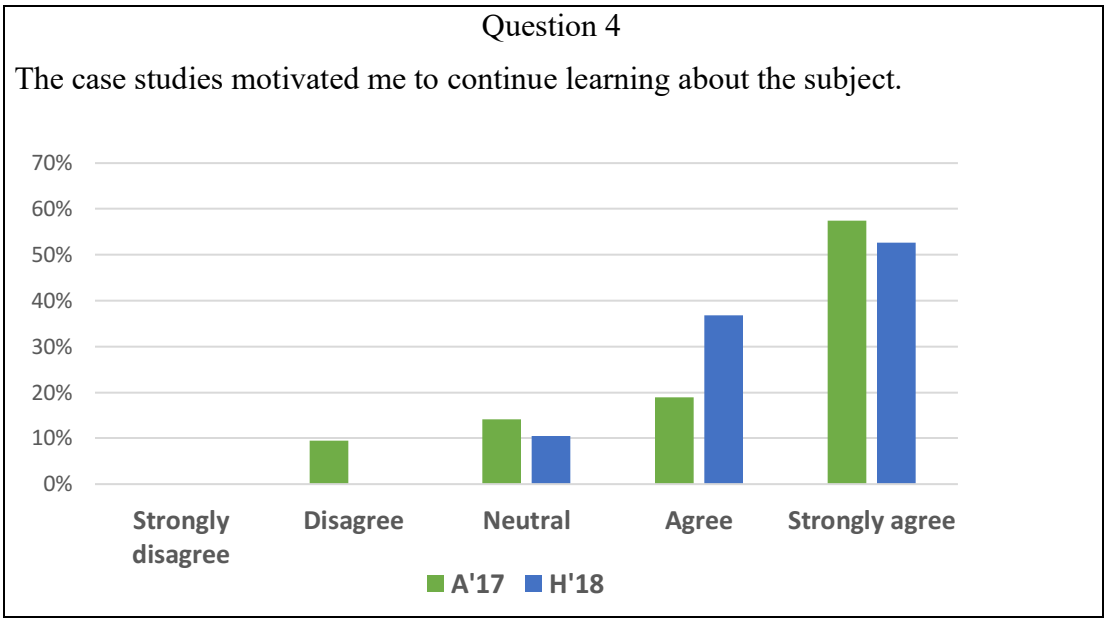


Figure 12 – Bar graph Question 4

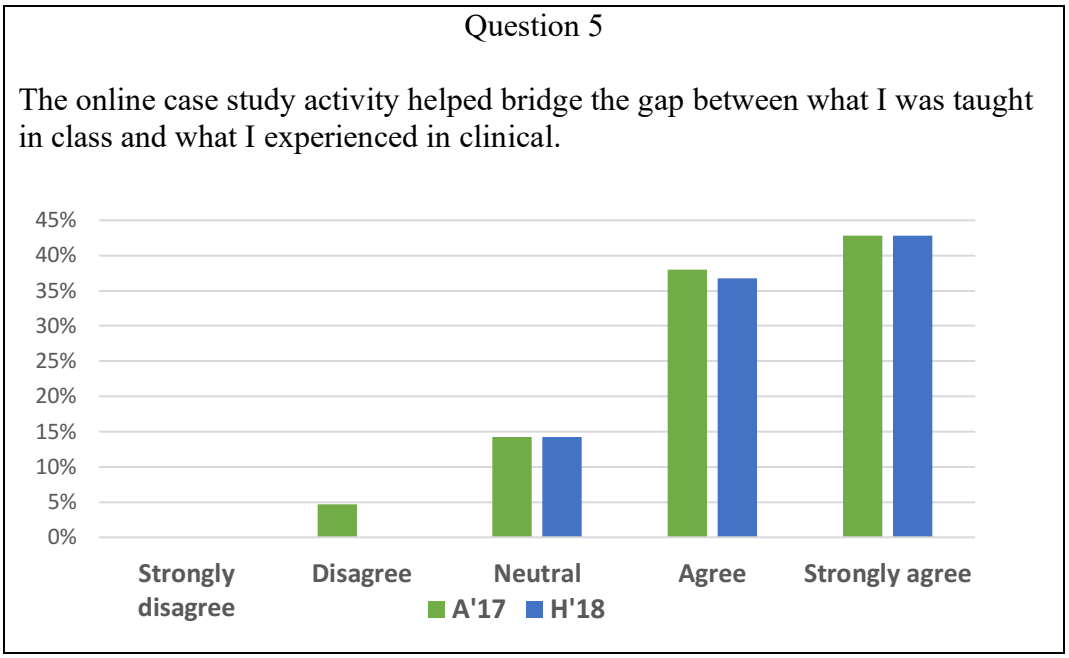


Figure 13 – Bar graph Question 5

In figure 13, Fall Group A and Winter Group B 'agreed' and 'strongly agreed' that online case studies helped bridge the gap between what was taught in class and the experience in the clinical setting. A small percentage of students 'disagreed', and were 'neutral' about the question. Figure 14, Fall Group A and Winter Group B 'agreed' and 'strongly agreed' about enjoying the experience of working on a case study on line. A small percentage of students were 'neutral' about the question.

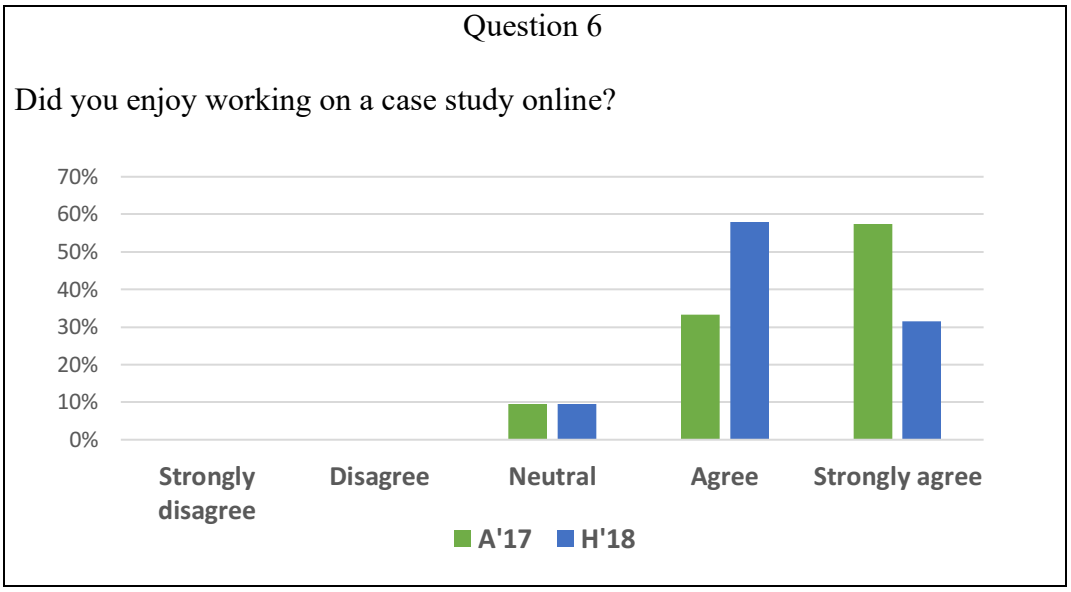


Figure 14 – Bar graph Question 6

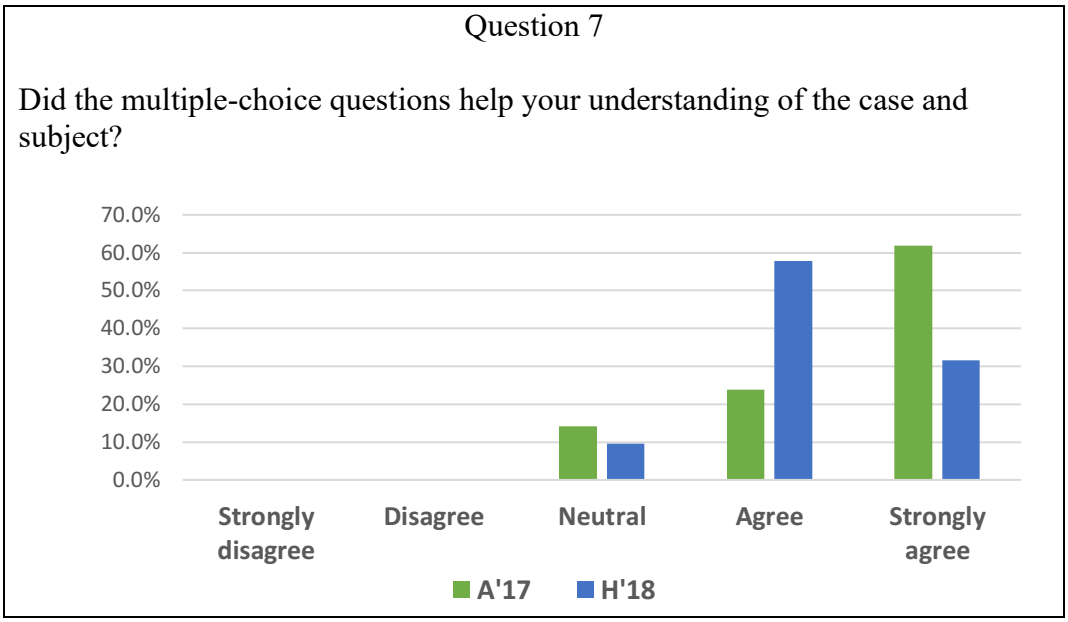


Figure 15 – Bar graph Question 7

In figure 15, Fall Group A and Winter Group B 'agreed' and 'strongly agreed' that the multiple-choice questions in the case studies helped with their understanding of the case and subject. A small percentage of students were 'neutral' about the question. In Figure 16, Fall Group A and Winter Group B 'agreed' and 'strongly agreed' that case studies help achieve their goals, whereas less than 30% of the group responded 'neutral' to the question and a small percentage 'disagreed'.

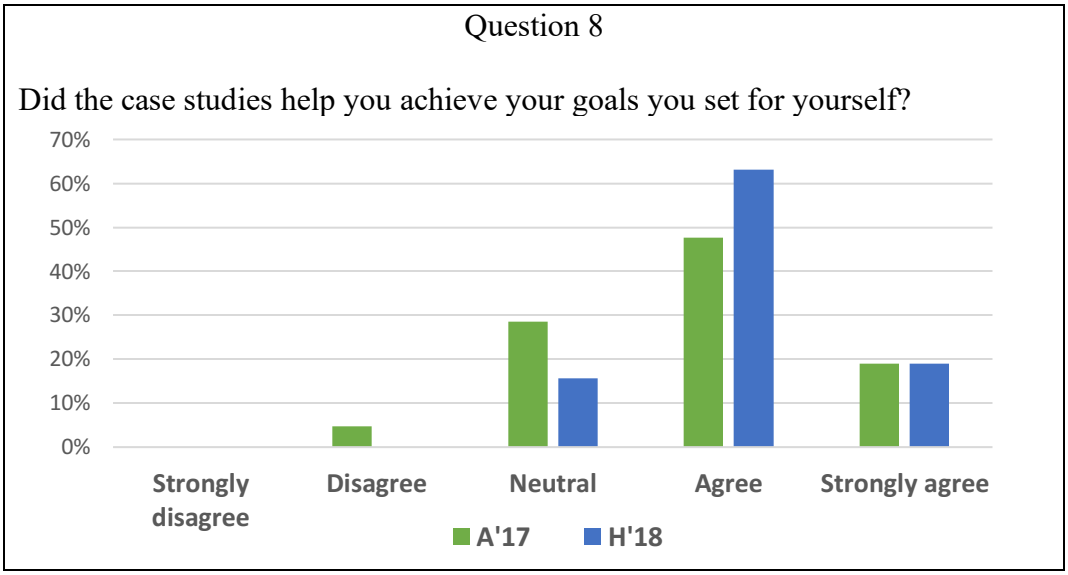


Figure 16 – Bar graph Question 8

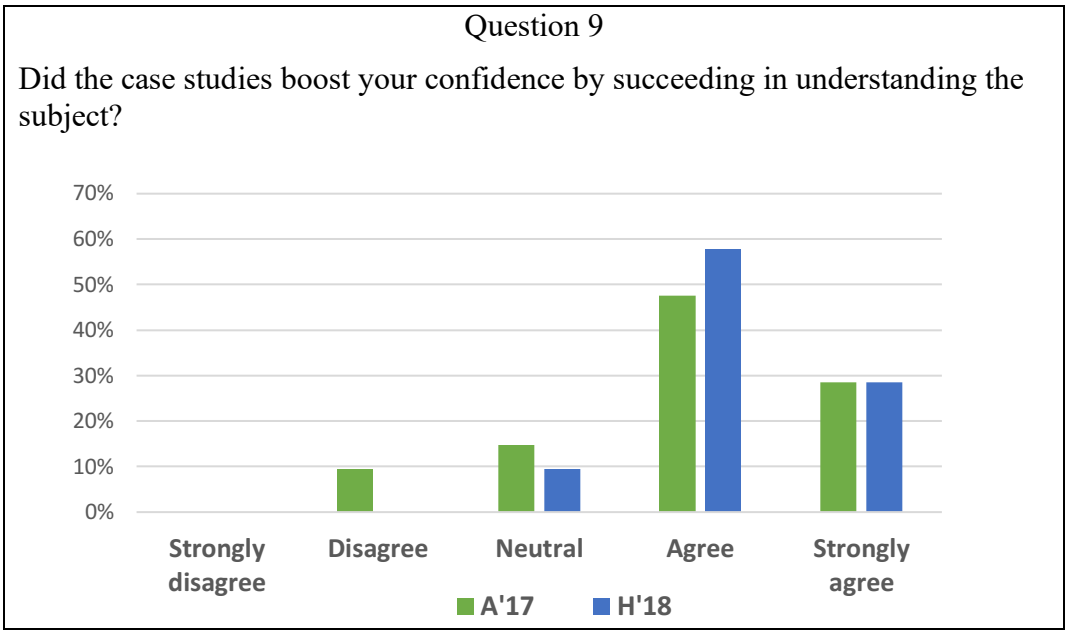


Figure 17 – Bar graph Question 9

In figure 17, Fall Group A and Winter Group B 'agreed' and 'strongly agreed' that case studies boost their confidence in understanding the subject. A small percent responded 'disagree' and 'neutral' to the question. In Figure 18, Fall Group A and Winter Group B 'agreed' and 'strongly agreed' that case studies helped take control of their own learning. Whereas, a small percentage of students responded 'neutral' to the question.

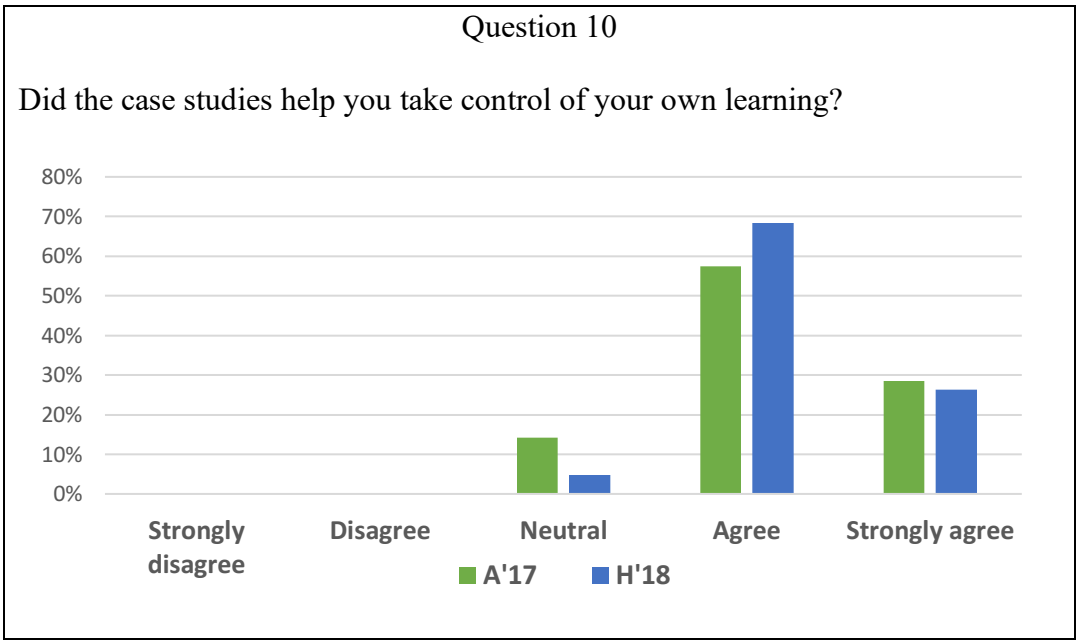


Figure 18 – Bar graph Question 10

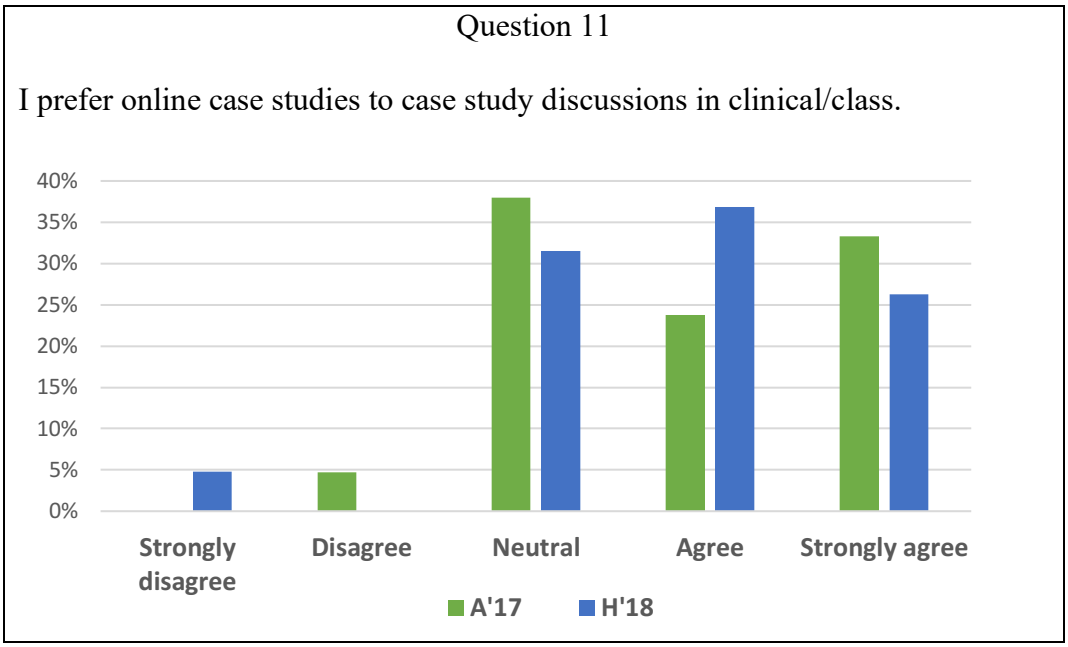


Figure 19 – Bar graph Question 11

In figure 19, Fall Group A and Winter Group B responded 'neutral', 'agreed' and 'strongly agreed' about preferring online case studies to case study discussion in class. A small percentage 'strongly disagreed' and 'disagreed' about the question. In figure 20, Fall Group A and Winter Group B responded 'strongly agreed', 'agreed' and 'neutral' to feeling prepared for the class exam after using the online case studies. A small percentage of students 'disagreed' with the question.

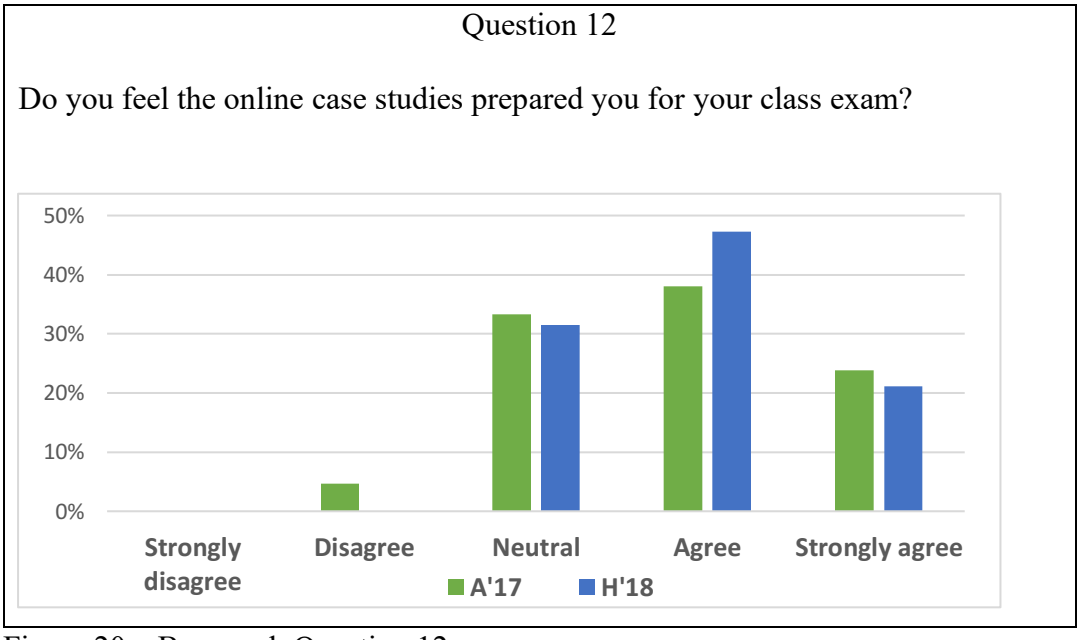


Figure 20 – Bar graph Question 12

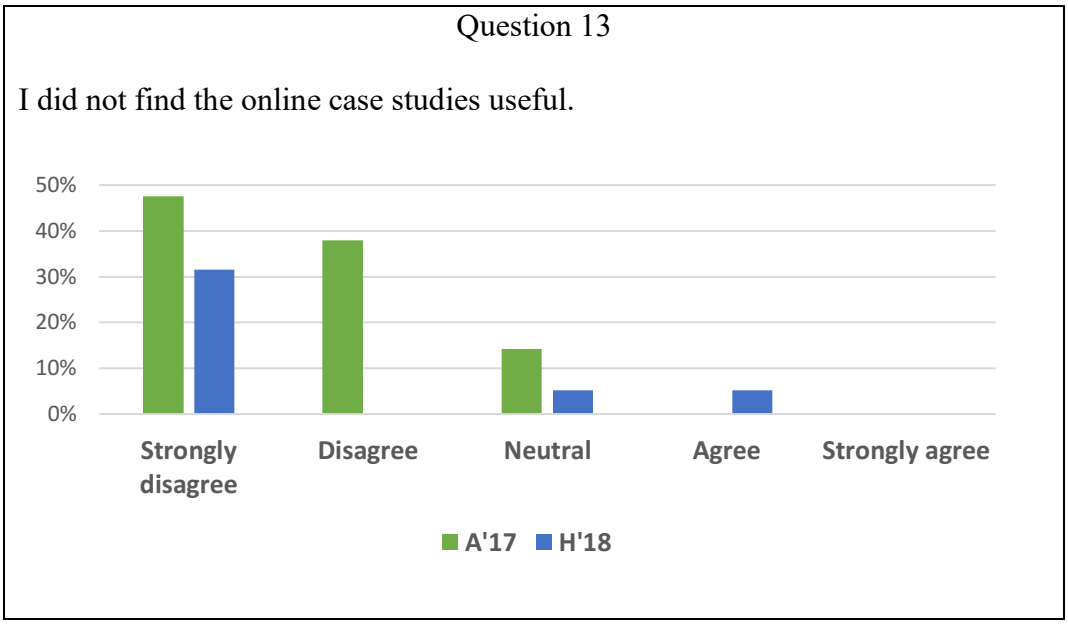


Figure 21 - Bar graph Question 13

In figure 21, Fall Group A and Winter Group B responded 'strongly disagree' and 'disagree' about not finding the online case studies useful. A small percentage of students responded 'neutral' and 'agree' to the question. In figure 21, Fall Group A and Winter Group B responded 'strongly disagree' and 'disagree' about not feeling that the case studies did not add much to their knowledge. A small percentage of students responded 'neutral' and 'agree' to this question.

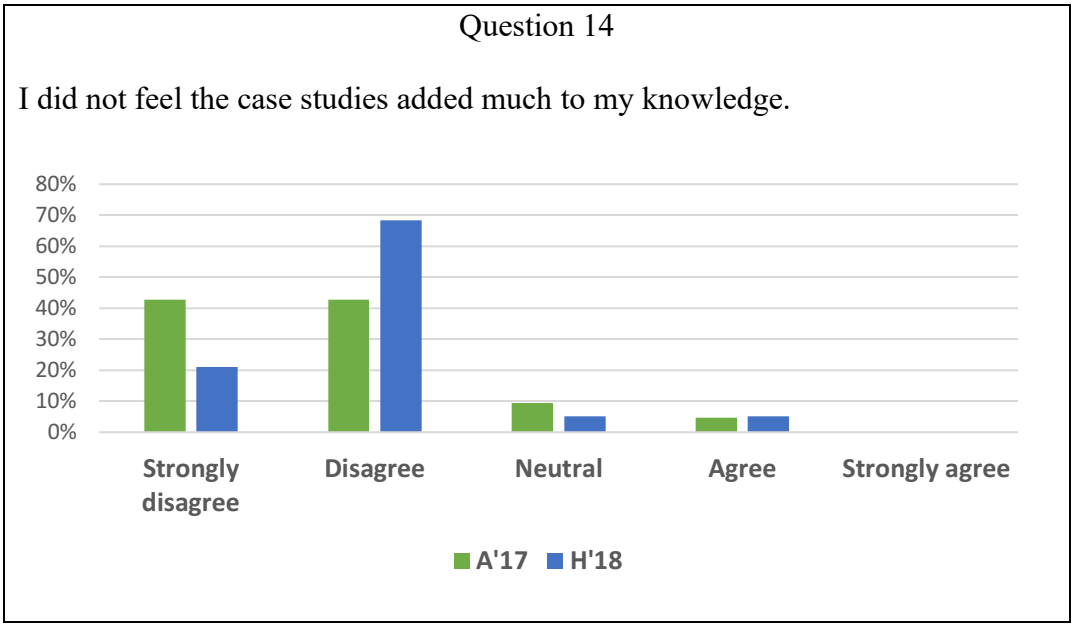


Figure 22 – Bar graph Question 14

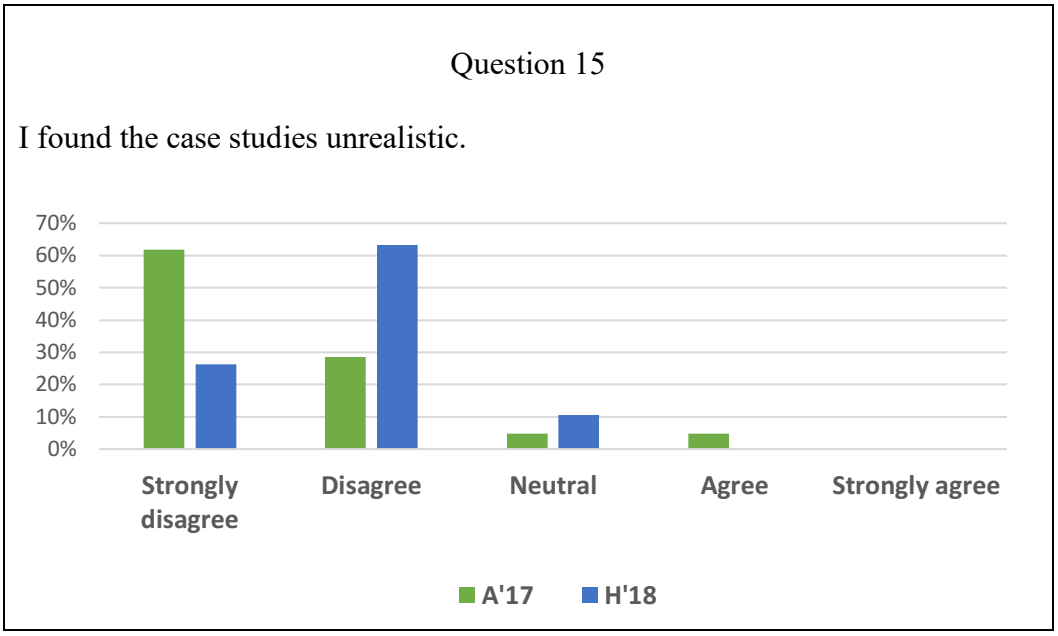


Figure 23 – Bar graph Question 15

In figure 23, Fall Group A and Winter Group B responded 'strongly disagree' and 'agree' about the case studies being unrealistic. A small percentage of students responded 'neutral' or 'agreed' with the statement. Figure 24, Fall Group A and Winter Group B responded 'strongly disagreed' and 'disagreed' about not enjoying the online case studies. A small percentage of students were 'neutral' to this question.

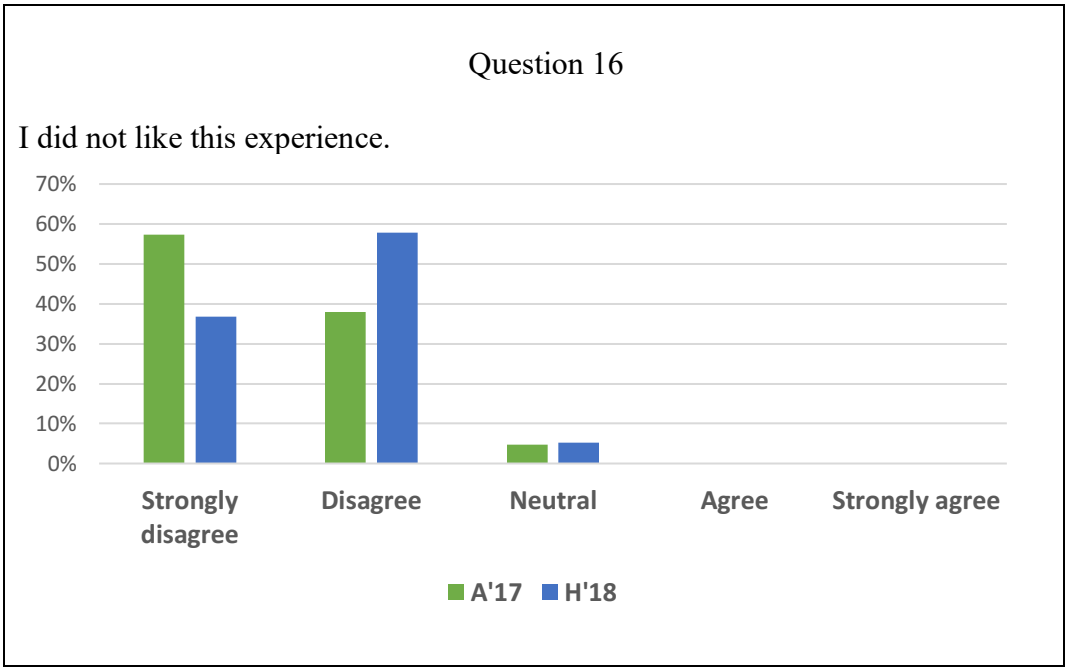


Figure 24 – Bar graph Question 16

## 5.2 DISCUSSION

This research project measured and analyzed the effect of using HESI online case studies on student achievement in a medical-surgical nursing course at Vanier College. It also explored students' perceptions and opinions of the HESI platform and how it enhanced the students' learning.

*Will online case studies foster higher performance outcomes through higher levels of thinking in students in the medical surgical nursing program?*

A review of the literature revealed two major themes related to the research question. The first theme reflected the impact of online case studies on academic performance. Previous studies by Mihal (2006), Witte & Witte (2001), and Young, Rose & Willson (2013) found positive differences between groups of students who used an online case studies platform, such as HESI, compared to students who did not use online case studies. This study measures whether students who did HESI online case studies for targeted classes using case studies would score higher than those classes that did not use case studies. A T1(pre-test), T2(post-test 1), T3(post-test 2) design was used in order to compare whether the students who used targeted classes with case studies would score higher on the T3 and final exam than the classes that did not have case studies.

The second theme revealed that providing students with the opportunity to apply what they have learned in scenarios and make connections to previously learned information helped to develop problem-solving and critical thinking skills. The process of using a collaborative tool transformed the students' experience into an individually paced learning opportunity to improve outcomes. The questionnaire responses in this project shed light on the important learning process and outcomes when using online case studies.

In relation to the quantitative data in this project, a significant difference was not found for the T1. The grades on the T1 for both groups demonstrated that the T1 knowledge was equivalent and there was no significance between Fall Group A and Winter Group B. The topic knowledge for T2 also did not show significance between the two groups. Although, the students did score slightly higher compared to the T1 results because the T2 was handed out after the topic was presented. This meant that the students' in both groups benefited from the intervention using case

studies. Both groups scored slightly higher in T2 compared to T1 because there was classroom instruction prior to administering T2. This allowed for exposure to the topic prior to writing T2. As for T1, the students did not have classroom instruction prior to writing T1 resulting in only basic topic knowledge prior to the classroom instruction. This demonstrates that the classroom instruction benefitted the students.

The hypothesis was tested when the students' scores in Fall Group A and Winter Group B for the T3 with case studies showed a significant difference in relation to T3 scores without case studies. The mean improvement difference scores for topics with case studies ($m = 1.114$) were higher than for topics without case studies ($m = 0.354$), this difference was significant at $p = 0.002$.

Student's grades were also analyzed to determine whether there was improvement in the final exam marks. Term test 1 and 2 marks were compared to the final grade average for Fall Group A and Winter Group B to see if there was an improvement in scores. Fall Group A had a lower-class average on term test 1 and 2 as compared to Winter Group B. Fall Group A performed better in the final exam compared to Winter Group B. The comparison scores for topics using case studies and topics with no case studies in Fall Group A and Winter Group B did not show significant differences at $p = 0.079$.

We also looked at the time spent on case studies. The Winter Group B spent more time on the case study activity compared to Fall Group A. Both groups often attempted the same case studies several times but it was uncertain if the students took longer to finish the case study at first attempt or wanted to improve their score after the first attempt. There was no significant difference in relation to hours spent on case studies and outcomes.

Historically, students in the Fall Group A have a more difficult time in relation to performance in term tests and clinical skills compared to the students in the winter semester who are Winter Group B. The differences in performance is likely due to the fact that Fall Group A has little clinical experience and is being introduced to the second year of the program for the first time. Additionally, they may be experiencing an education lag from being off all summer with no review of nursing content. Winter Group B on the other hand, is entering the winter semester with more clinical experience, no lag in their nursing studies and perform better in their term tests. This study

demonstrated that Fall Group A and Winter Group B benefitted from the use of case studies. The online case studies may have helped struggling students to pass final exam topics and subsequently to pass the course. Interestingly, when we look at the time spent on the case studies, Fall Group A spent less time than Winter Group B. We would assume that spending more time on case studies would correlate with better marks on the final exam. Fall Group A, out-performed Winter Group B in the final exam by a small percentage and yet Fall Group A spent less time online.

The second research question involved a questionnaire to elicit students' perceptions and opinions about using HESI online case studies. Students reported that the case studies allowed deeper learning of the subjects taught in class. They also reported that case studies helped them understand the topic, motivated them to continue learning about the topic and helped bridge the gap between what was taught in class and the experiences they encountered in the clinical setting. The data also suggested that students enjoyed the online experience as they were able to learn at their own pace, and preferred online case studies to case study discussion in clinical/class. The majority of the students agreed that the online case studies were useful to their learning, added to their knowledge and were realistic to what they encountered in the clinical setting. Most students expressed that the use of online case studies was an enjoyable experience.

# CHAPTER 6: CONCLUSIONS

## 6.1 IMPLICATIONS FOR NURSING EDUCATION AND FUTURE STUDIES

The nursing profession has evolved overtime with competing demands on our students to excel in theory and clinical practice. The use of technology in today's practice is essential in our teaching as we move the students forward in advancing their clinical skills and understanding of various disease processes. HESI online case studies offer valuable tools for students to use in conjunction with traditional teaching methods that help bridge the gap between theory and practice. This project did find statistical significance in the T3 in topics that used case studies. The scores also showed that the case studies may have helped those students with weak scores perform better on the final exam.

Surprisingly, the results for the final exam did not show significance for Winter Group B. Fall Group A may have benefitted from the case studies due to the increase in the final mean grade compared to term test 1 and 2. Another factor concerning the final exam is that other topics were tested but were not part of the targeted case study research. Using case studies for all topics intended for the final exam may have closely reflected higher scores and significance.

Learning theories predict that students would perform better when using case studies than no case studies for the integration of new nursing topics. The positive outcomes outlined in this research reflect that using case studies had a significant impact on the student's T3 scores and may have helped students who were struggling in Fall Group A to succeed in the final exam. The online case studies were set up to provide students with the opportunity to retake the multiple-choice test and improve their score. Due to confidentiality of the marks in the online system, it was not used for this study.

The student questionnaire revealed that student perceptions/opinions about the use of online case studies and the learning process were favourable. Generally, students said that they found online case studies as a positive experience and preferred it over case study discussion in the classroom. The response indicated that the students were able to learn at their own pace and the multiple-choice questions helped them understand what they needed to learn and motivated them to continue learning about the subject. Also, the students overwhelmingly stated that case studies promoted deep learning as the case studies went beyond what was taught in the lecture. This study demonstrated this by significant improvement of scores on the T3 results.

## 6.2 LIMITATIONS

The focus of this study was to measure whether online case studies had an effect on student learning and outcomes in a medical-surgical nursing course. We measured the effects of case studies on T3 results and the final exam results as well as student opinions about the use of online case studies. It was hypothesized that students who used case studies would have better outcomes and greater understanding of their learning.

One limitation of this study was that we did not consider coding each student and following their progress across the continuum. Meaning, individually monitoring the student's grades to see if there was an overall individual improvement in their outcomes. By following each student, we would be able to identify if the student who was struggling with the topic did improve in outcomes due to the online case studies. For the goals set in this study, we wanted to have an overall look at the class' response to the use of case-studies versus no case studies therefore it was not necessary for this study to code each individual student.

Another limitation is expanding the case studies to more topics in the third section of the course. All topics represented in the third term test could be targeted for case studies and may have had better results in terms of significance. Only three topics were targeted out of five in the third section which did show improvement in the T3 results but showed no significance in the final exam. The final exam covered other topics and students may have performed poorly in those topics compared to the topics with case studies ultimately skewing the results and not demonstrating significance.

A final limitation of this study is the questionnaire. Although, the questionnaire did cover relevancy, deep learning and achievement of goals, but it did not ask specific questions related to the learning process. For instance, when asked about motivation to continue learning, a second question may have been added to elaborate on how the case studies motivated learning. Another question asked about deep learning of subjects when using case studies. Again, the process of how this happened or why was not elaborated in the questionnaire.

## 6.3 SUGGESTIONS FOR FURTHER RESEARCH

One suggestion for future study would be to understand how case studies affect transfer of knowledge in the clinical setting. Particularly, providing students with clinical experiences similar to what is presented in the case studies; such as a patient with cirrhosis. Students often struggle with complex care and will fall back to providing basic nursing care instead of basing their actions and interventions on an understanding of the symptoms presented in their patient. Providing case studies similar to the presenting symptoms of a disease process may help students overcome knowledge gaps and to subsequently provide safe and more relevant patient care. In this way, online case studies can be used as a preparatory tool prior for entering the clinical setting. Further research into this subject may show how online case studies can help students prepare for managing complex patient presentations.

It may be interesting to examine whether certain students benefited from online case studies due to their learning needs, the pace of online learning or the ability to re-try a case study. Students who are introverted may find online case studies an alternative to class discussion and beneficial to their learning needs.

The conclusion to this research is to expand beyond numerical outcomes as it limits the scope of how case studies can be used in the deep understanding of a subject. Online case studies can be used to complement preparatory work needed in the clinical setting as well as offer remediation for students who are struggling to understand a specific topic. What remains to be seen is how online case studies can be implemented in the nursing curriculum and used to improve overall outcomes for our students.

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**APPENDIX A -** RESEARCH ETHICS APPROVAL LETTER

VANIER

**VANIER COLLEGE**
**RESEARCH ETHICS BOARD**
**RESEARCH CERTIFICATION**

This is to certify that the Research Ethics Board of Vanier College has examined the research proposal by **Michelle Bayard**

entitled: **The effect of using online case studies on student achievement in a medical-surgical nursing course.**

Ethics approval is granted for a period of one year from the date of this certificate. After that date, all research must cease unless an application for renewal has been approved. A final report summarizing the findings of the study should be sent to the Vanier College Research Office within six months of study completion.
Any changes or modifications to approved instruments and/or procedures must be submitted, through a new application, to the Vanier College Research Ethics Board prior to the collection of data.
Please note that all recruitment materials, whether verbal or written, paper or electronic, must include the statement that recruitment of participants from Vanier College has been approved by the Vanier Research Ethics Board.

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**RESEARCH ETHICS BOARD MEMBERS**

Karen White, Chair
Allan Insleay
Toby Moneit
Maggie McDonnell
Nicola McEnroe
Miki Harrar
James Pan
Bonnie Sonnenschein
Maria-Sophia Grabowiecki

June 12, 2017
Date

Board Chair

**APPENDIX B -** CONSENT FORM FOR STUDENT PARTICIPATION

# CONSENT TO PARTICIPATE IN RESEARCH

## The Effects of Using Online Case Studies on student achievement in a Medical-Surgical Nursing Course

You are asked to consent to participate in a research study by Michelle Bayard from the Nursing Department at Vanier College.

**PURPOSE OF THE STUDY**
This research project will examine and analyse the effects of using online case studies on students' achievement, using the case studies and students' opinion about using the online case-studies.

**PROCEDURES**
A quasi-experiment has been set up using the Medical-Surgical classes. You will be given a schedule and access to the case-studies. All we are requesting is your consent to include your term tests and final grade throughout the semester. **Your name and student number will be removed from the term tests; I will not know who you are when I look at the marks, and I will only have access to the relevant marks for data analysis after the final grades for the semester have been submitted – that is, I will not know which students participated in this study (by signing the consent form) until after your grades have been submitted.** You will also be asked to complete a brief questionnaire regarding your opinion about using case-studies as a learning tool, at the end of the term.

**POTENTIAL RISKS**
There are no know harms associated with your participation in this research. There will be no advantage or disadvantage as you are all participating in the same study, and students who do not agree to participate also have access to the case studies for review of course material.

**POTENTIAL BENEFITS TO PARTICIPANTS AND/OR EDUCATIONAL INSTITUTIONS**
This research hopes to identify the potential benefits of using online case-studies in a Medical-Surgical class, and may help direct pedagogical remediation or development at Vanier College or other educational institutions.

**CONFIDENTIALITY**
All information about this study will be confidential. No information that discloses your identity will be released or published without your consent. The data from the research will be provided only to the researcher (Michelle Bayard).

**PARTICIPATION AND WITHDRAWAL**

**You may choose to participate or withdraw from this study.** You may exercise your right to not include your data in the study. Withdrawing from the study will have no negative consequences.

**RIGHTS OF RESEARCH PARTICIPANTS**

**Participation in research is voluntary. If you choose not to participate, you will continue to have access to the case-studies and quality education.** If you do not want to participate in the study at any time you can say so. You will continue to have access to quality education.

**SIGNATURE OF RESEARCH PARTICIPANT**

I have read the information "The effects of using online case-studies in a Medical-Surgical nursing course" as outlined above. I agree to allow the researcher access to my test grades for this course, for the purpose of this research.

---

Name of Participant

---

Signature of Participant

---

Date

**APPENDIX C -** STUDENT QUESTIONNAIRE

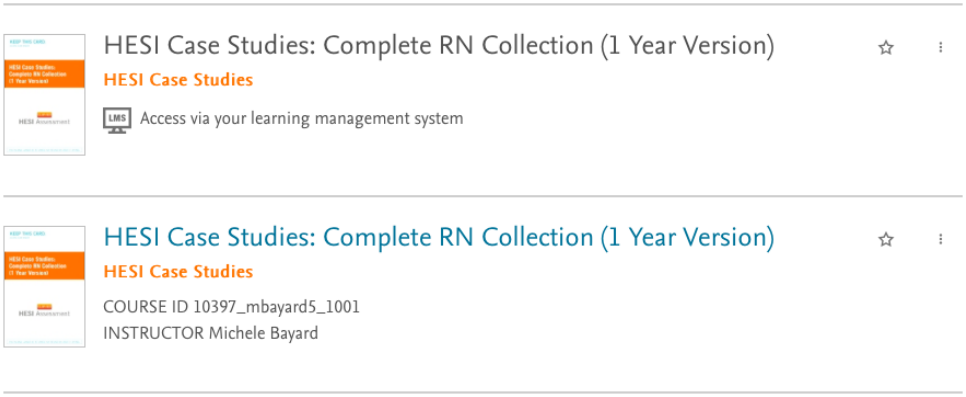
| Questions | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| 1. I felt the case studies were relevant in my learning about subjects taught in my class. | | | | | |
| 2. The case studies allowed for a deeper learning of the subjects taught in my class. | | | | | |
| 3. The case studies helped me understand the topic taught in class. | | | | | |
| 4. The case studies motivated me to continue learning about the subject. | | | | | |
| 5. The online case study activity helped bridge the gap between what I was taught in class and what I experienced in clinical. | | | | | |
| 6. Did you enjoy working on a case study online? | | | | | |
| 7. Did the multiple-choice questions help you're your understanding of the case and subject? | | | | | |
| 8. Did the case studies help you achieve your | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| goals you set for yourself? | | | | | |
| 9. Did the case studies boost your confidence by succeeding in understanding the subject? | | | | | |
| 10. Did the case studies help you take control of your own learning? | | | | | |
| 11. I prefer online case studies over case study discussions in clinical/class. | | | | | |
| 12. Do you feel the online case studies prepared you for your class exam? | | | | | |
| | | | | | |
| **Questions** | **Strongly Disagree** | **Disagree** | **Neutral** | **Agree** | **Strongly Agree** |
| 13. I did not find the online case studies useful. | | | | | |
| 14. I did not feel the case studies added much to my knowledge. | | | | | |
| 15. I found the case studies unrealistic. | | | | | |
| 16. I did not like this experience. | | | | | |
| **Questions** | **Case 1** | **Case 2** | **Case 3** | **All** | **Non** |
| 17. How many online case studies did you complete? | | | | | |

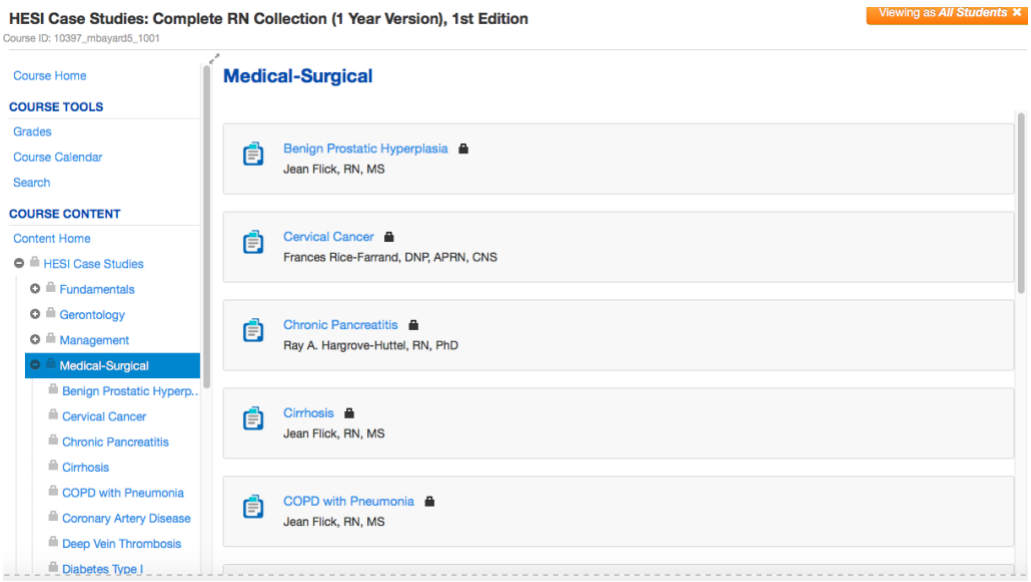
| |
|---|
| **18. If you did not complete all the case studies, please give a reason below.** |
| **19. Please give additional comments not covered in the questionnaire.** |

**APPENDIX D -** THE HESI CASE STUDIES INTERFACE AND DATA

Students access the online platform by signing in with a username and password. They must enter the course ID number to be allowed into the case study section of the course.

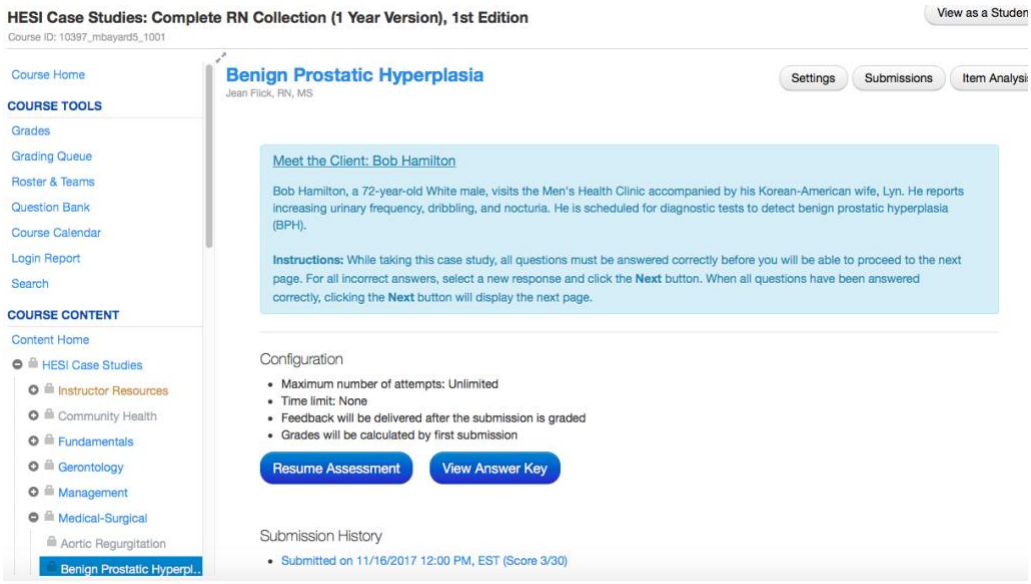



Once the students are logged into the course they have access to the course tools and course content.

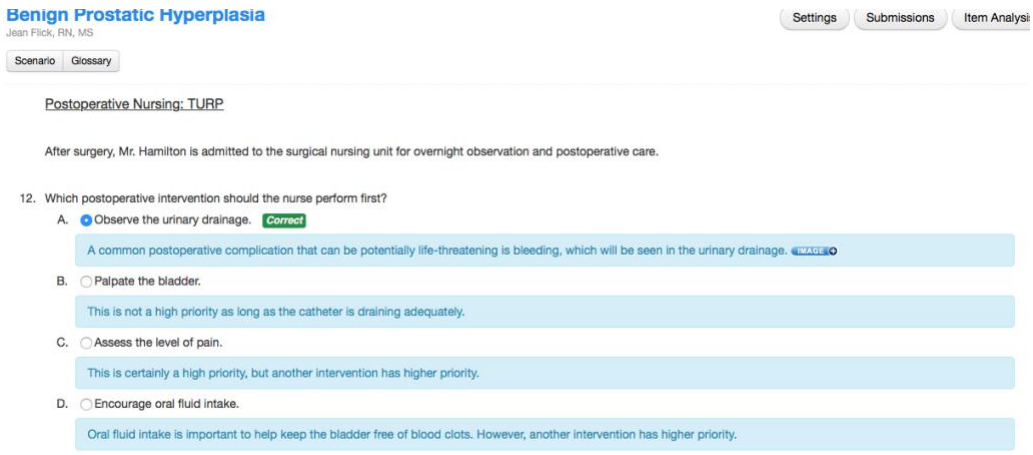



Example of the HESI Online Course Interface

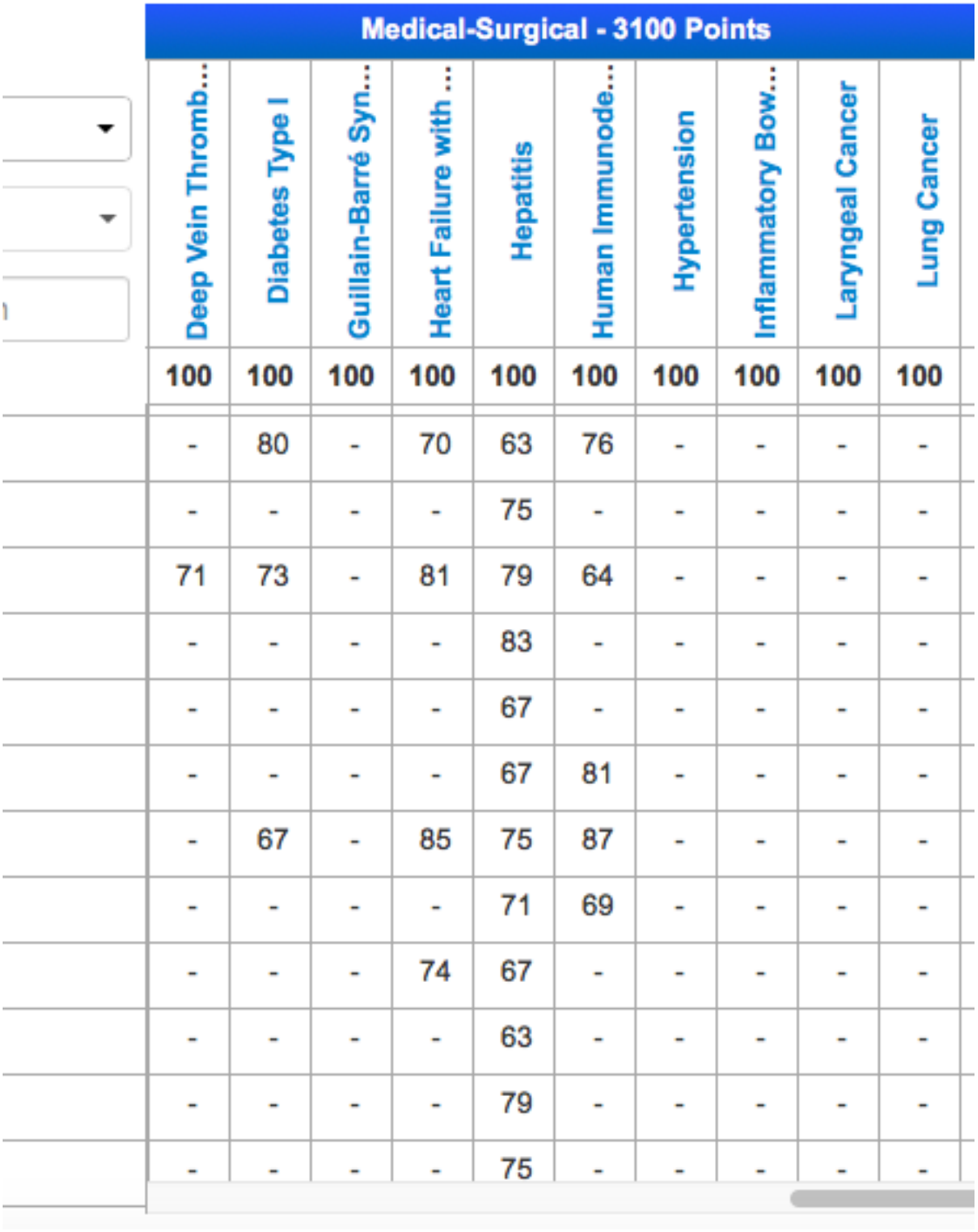
The following is an example of a case study with a multiple-choice question and student progress report.




Example of a HESI Online Case Study




Example of a HESI Online Case Study Multiple-Choice Question



| Medical-Surgical - 3100 Points | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Deep Vein Thromb... | Diabetes Type I | Guillain-Barré Syn... | Heart Failure with ... | Hepatitis | Human Immunode... | Hypertension | Inflammatory Bow... | Laryngeal Cancer | Lung Cancer |
| 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| - | 80 | - | 70 | 63 | 76 | - | - | - | - |
| - | - | - | - | 75 | - | - | - | - | - |
| 71 | 73 | - | 81 | 79 | 64 | - | - | - | - |
| - | - | - | - | 83 | - | - | - | - | - |
| - | - | - | - | 67 | - | - | - | - | - |
| - | - | - | - | 67 | 81 | - | - | - | - |
| - | 67 | - | 85 | 75 | 87 | - | - | - | - |
| - | - | - | - | 71 | 69 | - | - | - | - |
| - | - | - | 74 | 67 | - | - | - | - | - |
| - | - | - | - | 63 | - | - | - | - | - |
| - | - | - | - | 79 | - | - | - | - | - |
| - | - | - | - | 75 | - | - | - | - | - |

Example of the Student Progress Report

The progress report allows the student view their mark at first attempt of the case study. The system allows the student to redo the case study questions to improve their mark. The marks in the case study were not used for this research.

**APPENDIX E -** SAMPLE EXAM

**Key feature/Learning outcome:** Understand the post-operative complications of TURP
**Nursing process:** Evaluate
**Question level (Bloom's taxonomy):** Apply

1. After a transurethral resection of the prostate (TURP), a patient with continuous bladder irrigation complains of painful bladder spasms. The nurse observes a decrease in urine output and clots in the urine. Which action should the nurse take first?

   A. Increase the flow rate of the bladder irrigation
   B. Administer the prescribed IV morphine sulfate
   C. Give the patient the prescribed belladonna and opium suppository
   D. Manually instill and then withdraw 50 mL of saline into the catheter.

2. To determine the severity of the symptoms for a patient with benign prostatic hyperplasia (BPH) the nurse will ask the patient about:

   A. Blood in the urine
   B. Lower back pain
   C. Erectile dysfunction
   D. Strength of the urinary stream

3. When teaching a patient who is scheduled for a transurethral resection of the prostate (TURP) about continuous bladder irrigation, which information will the nurse include?

   A. Bladder irrigation decreases the risk of postoperative bleeding
   B. Hydration and urine output are maintained by bladder irrigation
   C. Bladder irrigation prevents obstruction of the catheter after surgery
   D. Antibiotics are infused on a continuous basis with bladder irrigation.

Sample T1, T2, T3 question using Bloom’s taxonomy.